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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY  
DIVISION OF WATER POLLUTION CONTROL  
2200 CHURCHILL ROAD  
SPRINGFIELD, ILLINOIS 62706



## 1981 VOLUNTEER LAKE

## MONITORING PROGRAM REPORT

NATURAL HISTORY SURVEY

AUG 27 1982

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT  
FOR  
BALDWIN LAKE, RANDOLPH COUNTY, ILLINOIS

A Cooperative Citizen-  
Illinois Environmental Protection Agency  
Project

May, 1982  
Illinois Environmental Protection Agency  
2200 Churchill Road  
Springfield, Illinois 62706

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## ACKNOWLEDGEMENTS

This is one of 87 reports prepared for lakes in the 1981 Volunteer Lake Monitoring Program. It represents the coordinated effort of many individuals.

Illinois EPA's Ambient Monitoring Unit, Planning Section, Division of Water Pollution Control, under the direction of Kenneth R. Rogers, was responsible for the design and implementation of the program, as well as preparation of this report. Substantial assistance was provided by the Agency's Public Participation Section supervised by Gloria Craven.

Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

Volunteers were trained by Public Participation Coordinators Carol Beim, Bob Hagele, William Hammel, Patrick McCarthy, Vanessa Musgrave, and Dawn Wrobel. Lake maps were prepared by J. W. Hammel and Bob Hagele. Lake assessment summaries were prepared by Patrick McCarthy.

Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

Donna Sefton, Howard Essig, John Little, John Lesnak, Carol Beim, and Bob Hagele wrote portions of the lake reports. Reports were edited by Planning Section and Public Participation staff, particularly Marilyn Budd and Mary Anderson. The contributions of Robert Clarke and Thomas Davenport are recognized.

Reports were typed by Word Processing under the direction of Norma Kraus and Diane Woodyard while Field Observations and Lake Assessment Summaries were typed by Betty Pennington, Lori Whalen, Karen Janssen, and Marilyn Budd.

## INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the volunteer data. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

## BACKGROUND

Baldwin Lake is a 1967 acre impoundment located in Randolph and St. Clair Counties, 2 miles north of Baldwin, Illinois. The impoundment, which was constructed in 1972 by Illinois Power Company, has a maximum depth of 49 feet, an average depth of 10 feet, and a storage capacity of 19,670 acre-feet (Table 1). Water is pumped into the lake from the Kaskaskia River and returned to the river from the impoundment.

Baldwin Lake serves as a cooling water supply for the power plant. The major recreational uses associated with the lake are fishing and waterfowl observation. Access is unlimited, but the hours of access are regulated.

Since Baldwin Lake was formed from a soil-bermed field with the water supply pumped in, there is no significant watershed. The lake shoreline is equally divided between cropland and riprap. Water level fluctuation is considered a moderate problem. Sediment in the Kaskaskia River is cited as the major pollution source.

Assessment information on Baldwin Lake was provided by Ray Martin, the Illinois Department of Conservation and the National Eutrophication Survey. Monitoring was performed by Ray Martin. Secchi disc depth, total depth, and field observations were recorded at three sites (located in Fig. 1) on nine dates in 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, BALDWIN LAKE, ST. CLAIR/RANDOLPH COUNTY, ILLINOIS (RO-B05-W).

I. GENERAL INFORMATION

River Basin: Kaskaskia  
Segment: B05

Ownership: IL Power Co. - Baldwin, IL

Surface Area (Acres): 1967.0\*  
Watershed Area (Acres): 3,113\*\*  
Maximum Depth (Feet): 48\*  
Average Depth (Feet): 10\*  
Storage Capacity (Acre/Feet): 19,670\*  
Inflowing Stream(s): Kaskaskia River  
Outflowing Stream(s): Kaskaskia River  
Water Retention Time: 7.900 years  
Lake Type: man-made  
Year Constructed: 1972

II. USAGE

Public Access: yes

Lake Usage:

Potable Water Supply: none  
Industrial Water Supply: none  
Agricultural Water Supply: none  
Cooling Water: very heavy  
Recreation: heavy  
Fishing: heavy  
Swimming: none  
Power Boating: none  
Row Boating or Canoeing: light  
Sailboating: light  
Camping: none  
Picnicking: light  
Waterfowl Hunting: none  
Waterfowl Observation: moderate  
Other:

Recreational Facilities:

1 boat launch ramp, 2 parking areas,  
small picnic area

Shoreline Usage (Percent):

Urban (Including Streets):  
Residential (Including Lawns):  
Golf Courses:  
Pasture or Grassland:  
Woodland:  
Row Crops: 10%  
Wetland:  
Other: rip rap - 90%

Watershed Usage (Percent):

Urban:  
Residential:  
Golf Courses:  
Pasture or Grassland:  
Woodland:  
Row Crops:  
Wetland:  
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: excellent  
Fishing: good/fair  
Conditions and Extent:  
Suspended Sediment: minimal  
Deposition of Sediment: slight  
Algal Blooms: minimal  
Aquatic Weeds: minimal  
Taste and/or Odor: minimal  
Water Level Fluctuation: moderate  
Fishkills: slight  
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

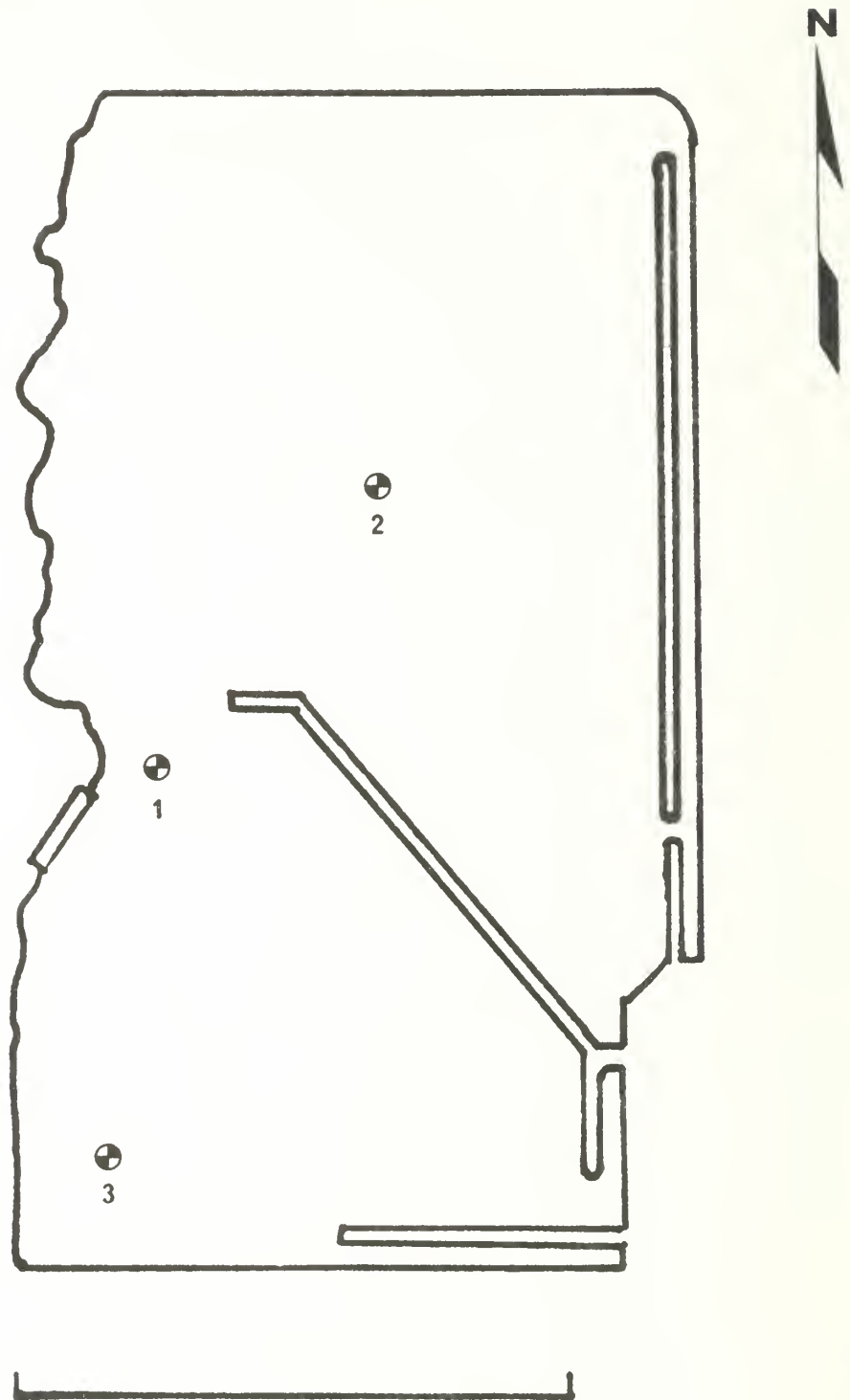
Sewage Treatment Plant Effluent:  
Industrial Discharge:  
Urban Storm Drainage:  
Septic Tanks:  
Pasture or Grassland Runoff:  
Cropland Runoff:  
Feedlot Runoff:  
Construction Site Runoff:  
Fertilizer or Pesticides from  
Lawns/Golf Courses:  
Orchards:  
Forestry Operations Runoff:  
Mining:  
Waterfowl:  
Sediment in Lake: yes  
Other: Kaskaskia River

V. LAKE MANAGEMENT

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

FIGURE 1  
BALDWIN LAKE

ST. CLAIR/ RANDOLPH COUNTIES



1 MILE

## RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report, "Volunteer Lake Monitoring, 1981", Section IV, "Understanding Illinois' Lakes."

The Secchi monitoring data for Baldwin Lake are summarized in Table 2 and plotted in Fig. 2. Total depth data are summarized in Table 3, field observations data are provided in Table 4.

### Transparency of Baldwin Lake

The average Secchi disc transparency of Baldwin Lake was 27.8 inches, which ranked 48th when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976), but in the normal range for Illinois lakes and compatible with most recreational uses.

### Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Baldwin Lake ranged from a minimum of 22 inches to a maximum of 30 inches.

Transparency was identical at Sites 1 and 2, and lower at Site 3; it averaged 30 inches, 30 inches and 23.3 inches at Sites 1, 2 and 3, respectively. Readings at all sites were less than the four feet minimum recommended for swimming on all sampling dates. The lower Secchi readings at Site 3 were probably related in part to the shallow depth of the site (average depth 5.3 feet) and the stirring up of sediment by wind and wave activity. It may also reflect the input of nutrients and sediment in the vicinity.

There were no seasonal differences in the transparency of Baldwin Lake. Field observations of water color and amount of suspended sediment and algae indicate that the transparency of Baldwin Lake is influenced by the presence of both algae and suspended sediment. A greenish - brown color and moderate amounts of algae and suspended sediment were observed on all sampling dates.

### Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

TABLE 2

SECC-1 DISC TRANSPARENCY (INCHES) BALDWIN/ST CLAIR COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

| DATE   | SITE 1 | SITE 2 | SITE 3 | MEAN | STD DEV |
|--------|--------|--------|--------|------|---------|
| 05/ 17 | 30.0   | 30.0   | 30.0   | 30.0 | 0.0     |
| 05/ 31 | 30.0   | 30.0   | 24.0   | 28.0 | 3.5     |
| 06/ 26 | 30.0   | 30.0   | 24.0   | 28.0 | 3.5     |
| 07/ 12 | 30.0   | 30.0   | 22.0   | 27.3 | 4.6     |
| 07/ 26 | 30.0   | 30.0   | 22.0   | 27.3 | 4.6     |
| 08/ 09 | 30.0   | 30.0   | 22.0   | 27.3 | 4.6     |
| 08/ 23 | 30.0   | 30.0   | 22.0   | 27.3 | 4.6     |
| 08/ 26 | 30.0   | 30.0   | 22.0   | 27.3 | 4.6     |
| 08/ 27 | 30.0   | 30.0   | 22.0   | 27.3 | 4.6     |

\*\*\*SUMMARY STATISTICS\*\*\*

| SITES    | LAKE |
|----------|------|
| MEAN     | 30.0 |
| STD DEV  | 0.0  |
| MIN      | 30.0 |
| MAX      | 30.0 |
| AV DEPTH | 17.1 |

-1 = missing value

See glossary for explanation of Summary Statistics

TABLE 3

DEPTH OF SITE (FEET) BALDWIN/ST CLAIR COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

| DATE   | SITE 1 | SITE 2 | SITE 3 | MEAN | STD DEV |
|--------|--------|--------|--------|------|---------|
| 05/ 17 | 43.0   | 7.0    | 5.0    | 18.3 | 21.4    |
| 05/ 31 | 48.0   | 28.0   | 6.0    | 24.7 | 21.4    |
| 06/ 26 | 38.8   | 19.0   | 5.0    | 20.7 | 16.6    |
| 07/ 12 | 46.0   | 18.0   | 5.5    | 23.2 | 20.7    |
| 07/ 26 | 40.0   | 20.0   | 5.5    | 24.8 | 22.1    |
| 08/ 09 | 48.0   | 18.0   | 5.5    | 23.8 | 21.8    |
| 08/ 23 | 46.0   | 15.0   | 5.0    | 22.3 | 21.2    |
| 08/ 26 | 48.0   | 18.0   | 5.0    | 23.7 | 22.1    |
| 08/ 27 | 49.0   | 18.0   | 5.5    | 24.2 | 22.4    |

\*\*\*SUMMARY STATISTICS\*\*\*

| SITES    | LAKE |
|----------|------|
| MEAN     | 46.1 |
| STD DEV  | 3.6  |
| MIN      | 38.8 |
| MAX      | 49.0 |
| AV DEPTH | 17.1 |

-1 = missing value

See glossary for explanation of Summary Statistics

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) BALDWIN/ST. CLAIR COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

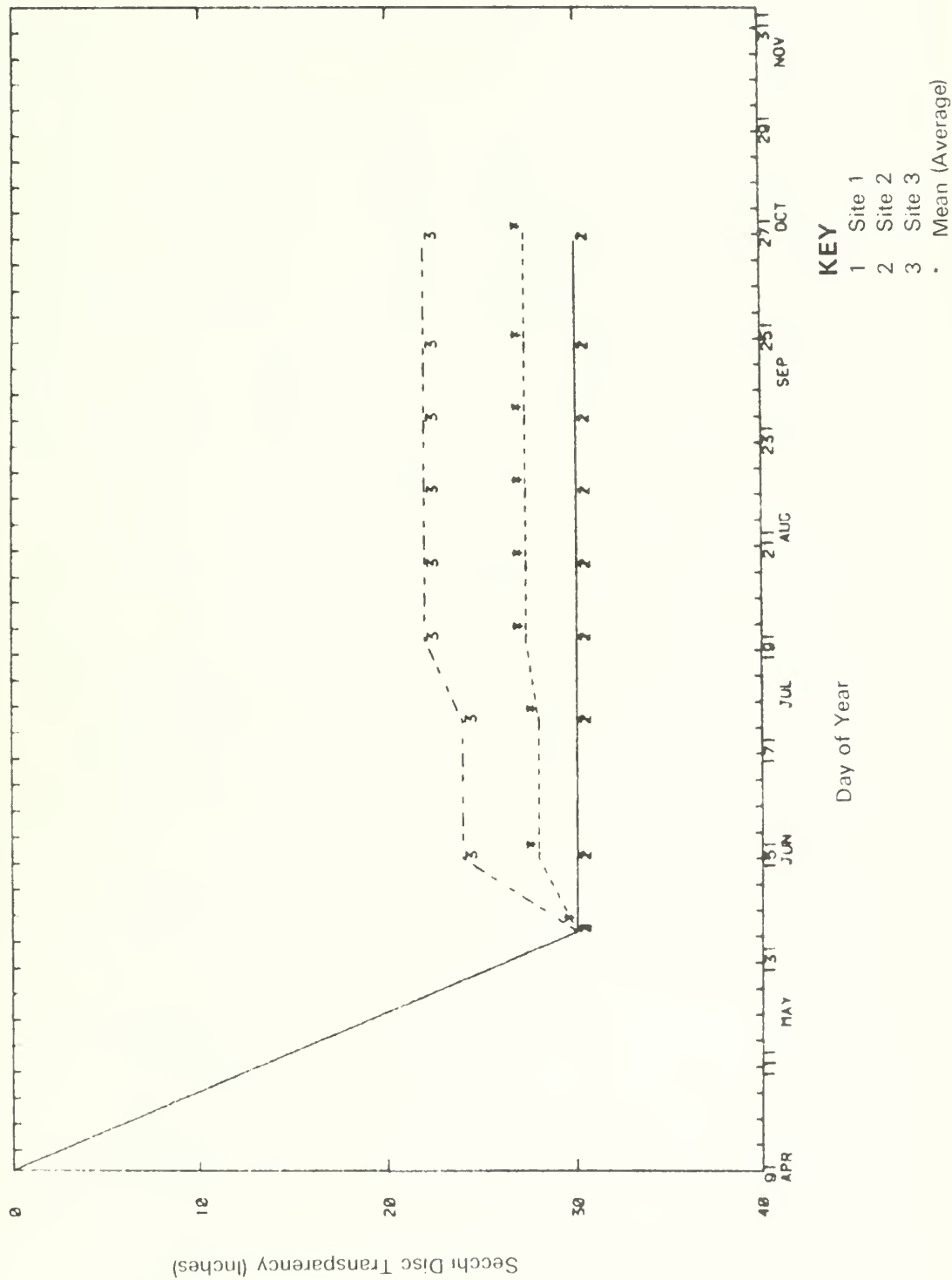


TABLE 4. FIELD OBSERVATIONS, BALDWIN LAKE, ST. CLAIR, RANDOLPH COUNTY, ILLINOIS.

| DATE    | OBSERVATION   | SITE 1  | SITE 2  | SITE 3  | WEATHER AT LAKE   | PRESENT  | PRECEDING 24 HOURS                               | OTHER COMMENTS  |
|---------|---|---|---|---|---|--|--|---|
| 5/17/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>moderate<br>minimal<br>minimal<br>waterfowl<br>none                | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>none    | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>none    | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | overcast<br>heavy rain<br>ripple<br>cool<br>NE   | clear<br>no rain<br>ripple<br>warm<br>S          | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |
|         |   | OBSERVATIONS MADE BY: Ray Martin  |   |   |   |  |  |   |
| DATE    | OBSERVATION   | SITE 1  | SITE 2  | SITE 3  | WEATHER AT LAKE   | PRESENT  | PRECEDING 24 HOURS                               | OTHER COMMENTS  |
| 5/31/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | overcast<br>heavy rain<br>moderate<br>warm<br>NE | overcast<br>heavy rain<br>moderate<br>warm<br>NE | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |
|         |   | OBSERVATIONS MADE BY: Ray Martin  |   |   |   |  |  |   |
| DATE    | OBSERVATION   | SITE 1  | SITE 2  | SITE 3  | WEATHER AT LAKE   | PRESENT  | PRECEDING 24 HOURS                               | OTHER COMMENTS  |
| 6/26/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | overcast<br>lt. rain<br>moderate<br>hot<br>S     | overcast<br>lt. rain<br>moderate<br>hot<br>S     | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |
|         |   | OBSERVATIONS MADE BY: Ray Martin  |   |   |   |  |  |   |
| DATE    | OBSERVATION   | SITE 1  | SITE 2  | SITE 3  | WEATHER AT LAKE   | PRESENT  | PRECEDING 24 HOURS                               | OTHER COMMENTS  |
| 7/12/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | clear<br>no rain<br>ripple<br>very hot<br>S      | clear<br>no rain<br>ripple<br>very hot<br>S      | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |
|         |   | OBSERVATIONS MADE BY: Ray Martin  |   |   |   |  |  |   |

TABLE 4 . FIELD OBSERVATIONS, BALDWIN LAKE, ST CLAIR/RANDOLPH COUNTY, ILLINOIS.

| DATE    | OBSERVATION   | SITE 1  | SITE 2  | SITE 3  | WEATHER AT LAKE   | PRESENT   | PRECEDING 24 HOURS                                   | OTHER COMMENTS  |
|---------|---|---|---|---|---|---|--|---|
| 7/26/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ray Martin | overcast<br>no rain<br>moderate<br>very hot<br>SW | overcast<br>heavy rain<br>moderate<br>very hot<br>SE | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS: |
|         |   |   |   |   |   |   |  |   |
| DATE    | OBSERVATION   | SITE 1  | SITE 2  | SITE 3  | WEATHER AT LAKE   | PRESENT   | PRECEDING 24 HOURS                                   | OTHER COMMENTS  |
| 8/9/81  | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ray Martin | few clouds<br>no rain<br>small<br>hot<br>SW       | clear<br>no rain<br>small<br>hot<br>S                | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS: |
|         |   |   |   |   |   |   |  |   |
| DATE    | OBSERVATION   | SITE 1  | SITE 2  | SITE 3  | WEATHER AT LAKE   | PRESENT   | PRECEDING 24 HOURS                                   | OTHER COMMENTS  |
| 8/23/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ray Martin | hazy<br>no rain<br>ripple<br>warm<br>SW           | clear<br>no rain<br>ripple<br>hot<br>SW              | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS: |
|         |   |   |   |   |   |   |  |   |
| DATE    | OBSERVATION   | SITE 1  | SITE 2  | SITE 3  | WEATHER AT LAKE   | PRESENT   | PRECEDING 24 HOURS                                   | OTHER COMMENTS  |
| 9/6/81  | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ray Martin | clear<br>no rain<br>calm<br>hot<br>N              | clear<br>no rain<br>ripple<br>hot<br>SW              | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS: |

TABLE 4. FIELD OBSERVATIONS, BALDWIN LAKE, ST. CLAIR/RANDOLPH COUNTY, ILLINOIS.

| DATE    | OBSERVATION   | SITE 1  | SITE 2  | SITE 3  | WEATHER AT LAKE   | PRESENT                                | PRECEDING<br>24 HOURS  | OTHER COMMENTS  |
|---------|---|---|---|---|---|--|--|---|
| 9/27/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | grnsh-brn<br>moderate<br>moderate<br>minimal<br>minimal<br>waterfowl<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | clear<br>no rain<br>calm<br>warm<br>NE | overcast<br>heavy rain<br>white caps<br>warm<br>SW<br>OBSERVATIONS MADE BY: Ray Martin | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |

| DATE | OBSERVATION   | SITE 1 | SITE 2 | SITE 3 | WEATHER AT LAKE   | PRESENT | PRECEDING<br>24 HOURS | OTHER COMMENTS  |
|------|---|--------|--------|--------|---|---------|-----------------------|---|
|      | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: |        |        |        | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: |         |                       | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |

1  
0  
1

| DATE | OBSERVATION   | SITE 1 | SITE 2 | SITE 3 | WEATHER AT LAKE   | PRESENT | PRECEDING<br>24 HOURS | OTHER COMMENTS  |
|------|---|--------|--------|--------|---|---------|-----------------------|---|
|      | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: |        |        |        | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: |         |                       | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |

| DATE | OBSERVATION   | SITE 1 | SITE 2 | SITE 3 | WEATHER AT LAKE   | PRESENT | PRECEDING<br>24 HOURS | OTHER COMMENTS  |
|------|---|--------|--------|--------|---|---------|-----------------------|---|
|      | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: |        |        |        | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: |         |                       | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Baldwin Lake (estimated at twice the Secchi depth) was 5.0 feet at Sites 1 and 2, and ranged from 3.7 to 5.0 feet at Site 3. Since Sites 1 and 2 are deep enough to thermally stratify and the lower limit of their euphotic zones was generally less than their total depth, low dissolved oxygen values would normally be expected in the bottom waters of these sites. At Site 3, its shallow depth (average depth 5.3 feet) may keep the bottom water oxygenated by mixing due to wind. However, circulation patterns in the lake brought about by the intake and discharge of water for cooling purposes may prevent thermal stratification and the bottom waters may also remain oxygenated at Sites 1 and 2.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, and other water quality problems.

## SUMMARY AND RECOMMENDATIONS

### Summary

Baldwin Lake, a large cooling water impoundment in southern Illinois, was sampled on nine dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Baldwin Lake (27.8 inches) ranked 48th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was slightly greater than the four feet minimum recommended for swimming by the Department of Public Health but was in the normal range for Illinois lakes and was compatible with most recreational uses. Above average rainfall during summer 1981 may be contributed to a lower than normal transparency.

Baldwin Lake is undergoing the process of eutrophication as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

### Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of portions of the lake shoreline by repairing riprap or some other means may also reduce sediment input.

Continued monitoring is recommended for Baldwin Lake. Consistent data gathered over a period of years is necessary to more fully document water quality trends, identify problems, and evaluate lake/watershed management strategies.

### REFERENCES

Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

Illinois Department of Public Health. 1976. The Minimum Sanitary Requirements for the Design and Operation of Swimming Pools and Bathing Beaches. State of Illinois, Department of Public Health, Springfield, Illinois.

Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

## GLOSSARY\*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

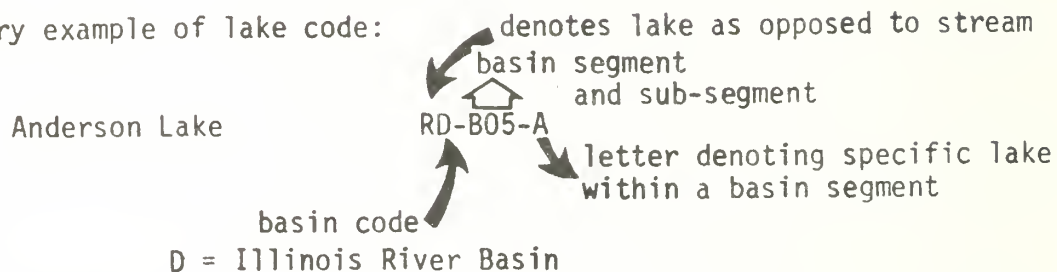
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

## ABBREVIATIONS AND SYMBOLS

av - average  
brn - brown  
brnsh-grn - brownish-green  
grn-brn - green-brown  
grnsh-brn - greenish-brown  
lt - light  
max - maximum value  
min - minimum value  
mod - moderately  
std. dev. - standard deviation  
v - very

Explanatory example of lake code:



\*Definitions of items in sense used in text

DS:sp,6207a,1-8



UNIVERSITY OF ILLINOIS-URBANA  
551.482V889X C002  
VOLUNTEER LAKE MONITORING PROGRAM SPRIN  
1981:5



3 0112 017525780

551.482

V889X

1981:4

Orig. 2

Nat Hist. Surv.

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SPRINGFIELD, ILLINOIS 62706



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## 1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT





1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT  
FOR  
ASHLEY LAKE, WASHINGTON COUNTY, ILLINOIS

A Cooperative Citizen -  
Illinois Environmental Protection Agency  
Project

May, 1982  
Illinois Environmental Protection Agency  
2200 Churchill Road  
Springfield, Illinois 62706

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## ACKNOWLEDGEMENTS

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Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

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## INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

## BACKGROUND

Ashley Lake is a 18 acre impoundment owned by the City of Ashley, Washington County, Illinois. The lake, which was constructed by damming an unnamed stream in 1941, has a maximum depth of 16 feet, an average depth of 8 feet and a storage capacity of 144 acre-feet (Table 1).

Ashley Lake serves as a potable, industrial and agricultural water supply. There is public access, with fishing being the major recreational use.

The 796 acre watershed of Ashley Lake is estimated to be 60 percent row crops. The shoreline is also primarily row crops (70 percent).

Deposition of sediment is considered a large problem for Ashley Lake, while suspended sediment, algal blooms and water level fluctuations are considered moderate problems. Cropland, pasture, grassland, and feedlot runoff and sediment in the lake are cited as potential pollution sources.

Assessment and monitoring information on Ashley Lake was provided by Ronald A. Schaefer. Secchi disc depth, total depth, and field observations were recorded at three sites (located in Fig. 1) on 11 dates in 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, ASHLEY LAKE, WASHINGTON COUNTY, ILLINOIS (RN-B01ZB).

# I. GENERAL INFORMATION

River Basin: Big Muddy  
Segment: B01  
Latitude:  
Longitude:  
Ownership: City of Ashley

Surface Area (Acres): 18  
Watershed Area (Acres): 796  
Maximum Depth (Feet): 16  
Average Depth (Feet): 8  
Storage Capacity (Acre/Feet): 144  
Inflowing Stream(s): unnamed  
Outflowing Stream(s): unnamed  
Water Retention Time: 0.302 year  
Lake Type: dammed stream  
Year Constructed: 1941

# II. USAGE

Public Access: yes  
Lake Usage:  
Potable Water Supply: heavy  
Industrial Water Supply: heavy  
Agricultural Water Supply: moderate  
Cooling Water: none  
Recreation:  
Fishing: very heavy  
Swimming: none  
Power Boating: none  
Row Boating or Canoeing: light  
Sailboating: none  
Camping: light  
Picnicking: light  
Waterfowl Hunting: none  
Waterfowl Observation: none  
Other:

Recreational Facilities:  
none

# Shoreline Usage (Percent):

Urban (Including Streets):  
Residential (Including Lawns): 10%  
Golf Courses:  
Pasture or Grassland: 10%  
Woodland: 10%  
Row Crops: 70%  
Wetland:  
Other:

# Watershed Usage (Percent):

Urban:  
Residential: 10%  
Golf Courses:  
Pasture or Grassland: 20%  
Woodland: 10%  
Row Crops: 60%  
Wetland:  
Other:

# III. WATER QUALITY AND PROBLEMS

General Water Quality: excellent  
Fishing: excellent  
Conditions and Extent:  
Suspended Sediment: moderate  
Deposition of Sediment: large  
Algal Blooms: moderate  
Aquatic Weeds: slight  
Taste and/or Odor: minimal  
Water Level Fluctuation: moderate  
Fishkills: minimal  
Other:

# IV. CAUSES OF WATER QUALITY PROBLEMS

# Potential Pollution Sources:

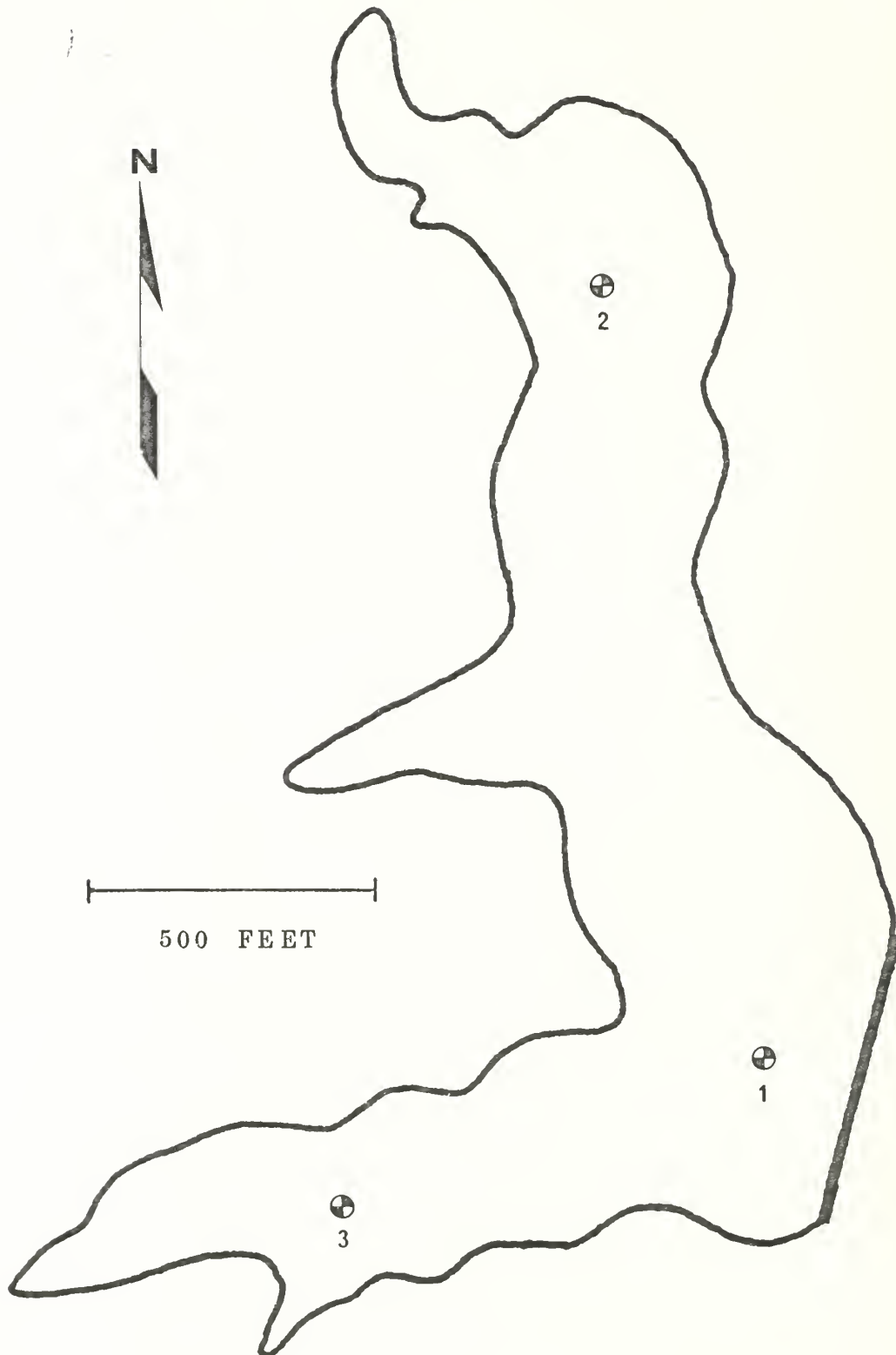
Sewage Treatment Plant Effluent:  
Industrial Discharge:  
Urban Storm Drainage:  
Septic Tanks:  
Pasture or Grassland Runoff: yes  
Cropland Runoff: yes (Major contributor to silt problem)  
Feedlot Runoff: yes  
Construction Site Runoff:  
Fertilizer or Pesticides from  
Lawns/Golf Courses:  
Orchards:  
Forestry Operations Runoff:  
Mining:  
Waterfowl:  
Sediment in Lake: yes  
Other:

# V. LAKE MANAGEMENT

Comments: copper sulfate at rate of 1 mg/l is applied  
during the warm months to control algae; treat  
drinking water with lime, alum, fluoride, & chlorine

Information Supplied By Ronald A. Schaefer (1981)

FIGURE 1  
ASHLEY LAKE  
WASHINGTON COUNTY



## RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Ashley Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

### Transparency of Ashley Lake

The average Secchi disc transparency of Ashley Lake was 21.8 inches, which ranked number 61 when the average transparencies of volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was in the range generally associated with use impairment problems in Illinois lakes.

A lengthy drought preceded the 1981 sampling, so the water level of Ashley Lake was 6 feet below normal on April 30. However, it was near spillway elevation throughout the rest of the sampling period. Rainfall was above normal during the summer of 1981; this may have contributed to a lower than usual transparency.

### Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Ashley Lake ranged from a minimum of 10 inches at Site 3 on May 29 to a maximum of 36 inches at Site 1 on July 26. Secchi readings were below the four feet minimum recommended for swimming at all three sites on every sampling date.

The clarity of Ashley Lake was relatively uniform at the three sites. Transparencies averaged 21.7 inches, 21.1 inches and 22.5 inches at Sites 1, 2 and 3 respectively. The low Secchi readings were probably related, in part, to the shallow depths of the sites which allowed wind and wave activity to resuspended the bottom sediment.

There were seasonal differences in the transparency of Ashley Lake. Lowest transparencies were recorded in midspring and were probably associated with the distribution of nutrients throughout the lake during spring turnover which triggered algal blooms, as well as increased amounts of suspended sediment on May 29 caused by heavy rains which fell prior to this sampling date.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) ASHLEY/VASHINGTON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

| DATE   | SITE 1 | SITE 2 | SITE 3 | MEAN | STD DEV |
|--------|--------|--------|--------|------|---------|
| 04/ 30 | 14.0   | 16.0   | 18.0   | 16.0 | 2.0     |
| 05/ 20 | 11.0   | 12.0   | 10.0   | 11.0 | 1.0     |
| 05/ 20 | 24.0   | 18.0   | 24.0   | 22.0 | 3.5     |
| 06/ 15 | 24.0   | 24.0   | 24.0   | 24.0 | 2.3     |
| 06/ 30 | 28.0   | 20.0   | 21.3   | 28.0 | 3.5     |
| 07/ 12 | 30.0   | 24.0   | 30.0   | 30.0 | 3.5     |
| 07/ 26 | 36.0   | 30.0   | 30.0   | 32.0 | 3.5     |
| 08/ 14 | 24.0   | 24.0   | 24.0   | 24.0 | 0.0     |
| 08/ 20 | 13.0   | 20.0   | 21.0   | 18.0 | 4.4     |
| 09/ 04 | 27.0   | 22.0   | 27.0   | 25.3 | 2.0     |
| 09/ 20 | 22.0   | 24.0   | 18.0   | 21.3 | 3.1     |
| 10/ 06 | 22.0   | 18.0   | 24.0   | 21.3 | 3.1     |
| 10/ 25 | 18.0   | 22.0   | 22.0   | 20.7 | 2.3     |

\*\*\*SUMMARY STATISTICS\*\*\*

| SITES    | LAKE |
|----------|------|
| MEAN     | 21.8 |
| STD DEV  | 22.7 |
| MIN      | 4.6  |
| MAX      | 5.6  |
| AV DEPTH | 10.0 |
|          | 36.0 |
|          | 5.0  |

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) ASHLEY/VASHINGTON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

| DATE   | SITE 1 | SITE 2 | SITE 3 | MEAN | STD DEV |
|--------|--------|--------|--------|------|---------|
| 04/ 30 | 7.0    | 3.0    | 3.0    | 4.5  | 2.6     |
| 05/ 20 | 11.0   | 4.0    | 0.0    | 7.0  | 3.0     |
| 06/ 15 | 13.0   | 0.0    | 10.0   | 0.3  | 4.0     |
| 06/ 30 | 12.0   | 4.0    | 2.0    | 0.0  | 6.3     |
| 07/ 12 | 13.0   | 4.5    | 0.0    | 7.5  | 4.0     |
| 07/ 26 | 13.0   | 3.5    | 0.0    | 7.5  | 5.3     |
| 08/ 14 | 13.0   | 4.5    | 5.0    | 7.5  | 4.0     |
| 08/ 20 | 13.5   | 5.0    | 0.5    | 0.0  | 4.0     |
| 09/ 04 | 13.5   | 5.0    | 0.5    | 0.0  | 4.0     |
| 09/ 20 | 12.0   | 3.0    | 0.5    | 0.0  | 4.6     |
| 10/ 06 | 13.5   | 5.0    | 0.5    | 0.0  | 4.3     |
| 10/ 25 | 13.0   | 4.0    | 7.5    | 8.2  | 4.5     |

\*\*\*SUMMARY STATISTICS\*\*\*

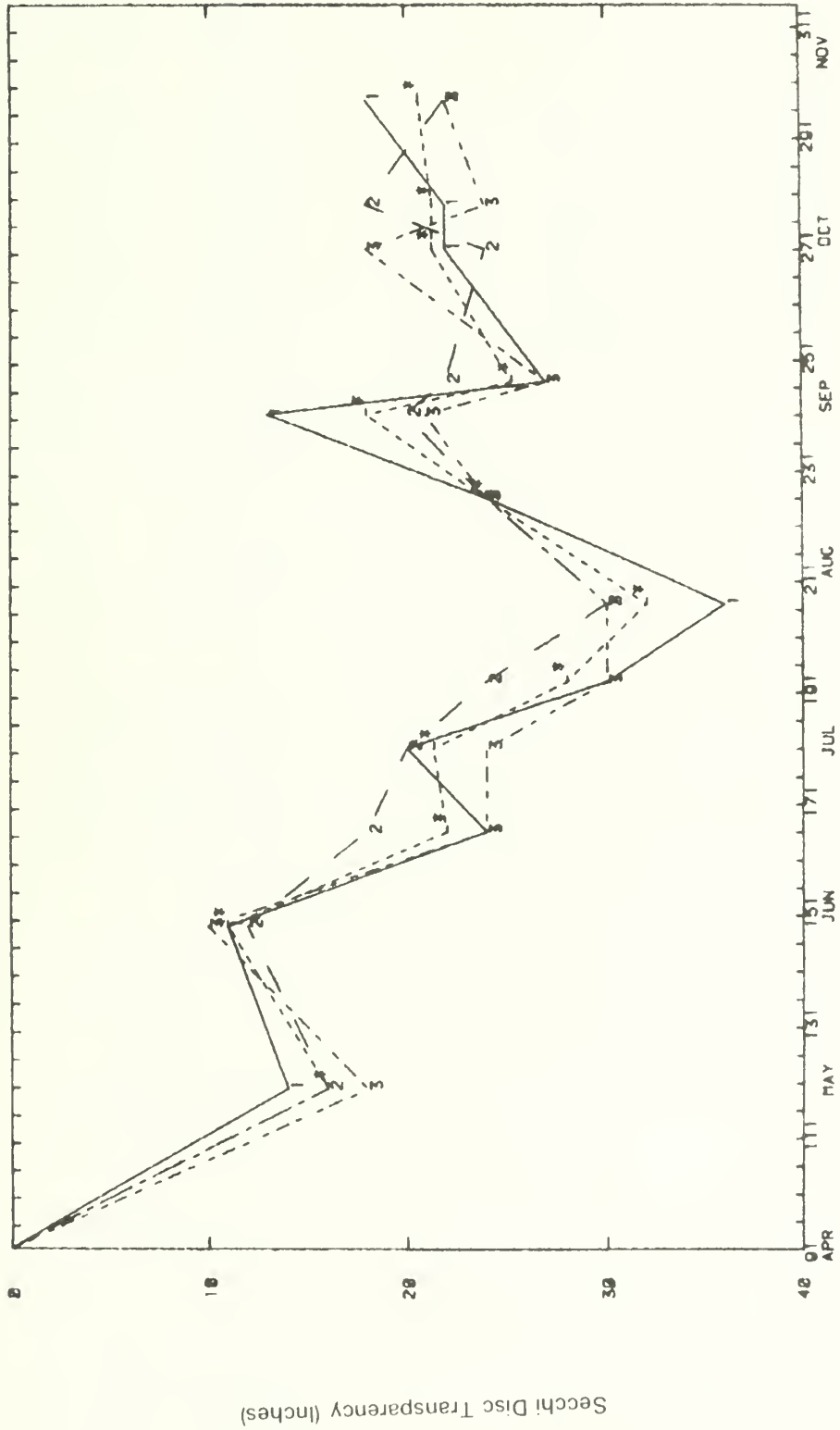
| SITES    | LAKE |
|----------|------|
| MEAN     | 12.4 |
| STD DEV  | 4.2  |
| MIN      | 0.0  |
| MAX      | 2.3  |
| AV DEPTH | 10.0 |
|          | 5.0  |

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) ASHLEY/WASHINGTON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



KEY

- 1 Site 1
- 2 Site 2
- 3 Site 3
- . Mean (Average)

Day of Year

TABLE 4. FIELD OBSERVATIONS, ASHLEY LAKE, WASHINGTON COUNTY, ILLINOIS

| DATE    | OBSERVATION   | SITE 1   | SITE 2   | SITE 3   | WEATHER AT LAKE   | PRESENT  | PRECEDING 24 HOURS                                | OTHER COMMENTS  |
|---------|---|--|--|--|---|--|---|---|
| 4/30/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>slight<br>moderate<br>minimal<br>minimal<br>algal col.<br>no odor | grnsh-brn<br>slight<br>moderate<br>minimal<br>minimal<br>algal col.<br>no odor | grnsh-brn<br>slight<br>moderate<br>minimal<br>minimal<br>algal col.<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ron Schaefer       | many clouds<br>no rain<br>small<br>warm<br>N   | many clouds<br>lt. rain<br>ripple<br>warm<br>NE   | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |
|         |   |  |  |  |   |  |   | below normal 72"<br>none<br>none<br>None applied since last test                        |
| DATE    | OBSERVATION   | SITE 1   | SITE 2   | SITE 3   | WEATHER AT LAKE   | PRESENT  | PRECEDING 24 HOURS                                | OTHER COMMENTS  |
| 5/29/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | mod. brown<br>moderate<br>minimal<br>minimal<br>minimal<br>none<br>no odor     | mod. brown<br>moderate<br>minimal<br>moderate<br>large<br>none<br>no odor      | mod. brown<br>moderate<br>minimal<br>slight<br>moderate<br>none<br>no odor     | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ronald A. Schaefer | hazy<br>no rain<br>ripple<br>warm<br>N         | clear<br>no rain<br>calm<br>hot<br>N              | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |
|         |   |  |  |  |   |  |   | above normal<br>none<br>none<br>None applied since last test                            |
| DATE    | OBSERVATION   | SITE 1   | SITE 2   | SITE 3   | WEATHER AT LAKE   | PRESENT  | PRECEDING 24 HOURS                                | OTHER COMMENTS  |
| 6/15/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grn-brn<br>moderate<br>moderate<br>minimal<br>slight<br>none<br>no odor        | brnsh-grn<br>moderate<br>moderate<br>slight<br>large<br>none<br>no odor        | grn-brn<br>moderate<br>moderate<br>minimal<br>moderate<br>none<br>no odor      | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ronald A. Schaefer | many clouds<br>no rain<br>ripple<br>hot<br>NE  | many clouds<br>V. lt. rain<br>ripple<br>hot<br>NE | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |
|         |   |  |  |  |   |  |   | normal<br>fishing, row<br>boating/canoeing<br>none<br>None applied since last test      |
| DATE    | OBSERVATION   | SITE 1   | SITE 2   | SITE 3   | WEATHER AT LAKE   | PRESENT  | PRECEDING 24 HOURS                                | OTHER COMMENTS  |
| 6/30/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | brnsh-grn<br>moderate<br>moderate<br>minimal<br>minimal<br>none<br>none        | brnsh-grn<br>large<br>moderate<br>slight<br>moderate<br>algal mats<br>fishy    | brnsh-grn<br>large<br>moderate<br>minimal<br>large<br>algal mats<br>fishy      | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ronald A. Schaefer | overcast<br>V. lt. rain<br>ripple<br>hot<br>NE | clear<br>no rain<br>calm<br>very hot<br>NE        | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |
|         |   |  |  |  |   |  |   | normal<br>none<br>none<br>None applied since last test                                  |

TABLE 4. FIELD OBSERVATIONS, ASHLEY LAKE, WASHINGTON COUNTY, ILLINOIS.

| DATE    | OBSERVATION   | PRECEDING 24 HOURS   |  |   | WEATHER AT LAKE                               | PRESENT   | OTHER COMMENTS   |
|---------|---|--|--|---|---|---|--|
| 7/12/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | very green<br>moderate<br>minimal<br>moderate<br>none<br>no odor           | SITE 1   | SITE 2  | SITE 3  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ronald A. Schaefer | clear<br>no rain<br>calm<br>hot<br>NE<br><br>WATER LEVEL OF LAKE: normal<br>RECREATIONAL USAGE: fishing<br><br>LAKE MANAGEMENT: none<br>ADDITIONAL COMMENTS:   |
|         |   | grn-brn<br>large<br>slight<br>slight<br>moderate<br>sediment<br>no odor    | grn-brn<br>large<br>slight<br>minimal<br>large<br>"clippings"<br>no odor   | grn-brn<br>large<br>slight<br>moderate<br>sediment<br>no odor             | hazy<br>no rain<br>calm<br>very hot<br>NE     |   |  |
| 7/26/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | mod. green<br>minimal<br>minimal<br>minimal<br>none<br>none                | SITE 1   | SITE 2  | SITE 3  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ronald A. Schaefer | overcast<br>mod. rain<br>moderate<br>hot<br>SW<br><br>WATER LEVEL OF LAKE: normal - full stage<br>RECREATIONAL USAGE: none<br><br>LAKE MANAGEMENT: 7/14/81 600# applied<br>.5 mg/l dosage .252 active copper sulfate<br>ADDITIONAL COMMENTS: Lake was full when applied. Algal control |
|         |   | mod. green<br>slight<br>minimal<br>minimal<br>moderate<br>none<br>musty    | grnsh-brn<br>slight<br>minimal<br>minimal<br>moderate<br>none<br>none      | mod. green<br>slight<br>minimal<br>minimal<br>moderate<br>none<br>musty   | overcast<br>no rain<br>hot<br>calm            |   |  |
| 8/14/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grn-brn<br>minimal<br>minimal<br>minimal<br>none<br>no odor                | SITE 1   | SITE 2  | SITE 3  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ronald A. Schaefer | many clouds<br>no rain<br>ripple<br>warm<br>NE<br><br>WATER LEVEL OF LAKE: above normal<br>RECREATIONAL USAGE: none<br><br>LAKE MANAGEMENT: none<br>ADDITIONAL COMMENTS:   |
|         |   | grnsh-brn<br>slight<br>minimal<br>moderate<br>moderate<br>none<br>no odor  | grnsh-brn<br>slight<br>minimal<br>moderate<br>moderate<br>none<br>no odor  | grnsh-brn<br>slight<br>minimal<br>slight<br>slight<br>none<br>no odor     | few clouds<br>no rain<br>ripple<br>warm<br>NE |   |  |
| 8/29/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | mod. brown<br>moderate<br>minimal<br>minimal<br>minimal<br>none<br>no odor | SITE 1   | SITE 2  | SITE 3  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: Ronald A. Schaefer | overcast<br>mod. rain<br>moderate<br>warm<br>NE<br><br>WATER LEVEL OF LAKE: above normal<br>RECREATIONAL USAGE: none<br><br>LAKE MANAGEMENT: none<br>ADDITIONAL COMMENTS:  |
|         |   | 1t. brown<br>moderate<br>minimal<br>minimal<br>moderate<br>none<br>no odor | 1t. brown<br>moderate<br>minimal<br>minimal<br>moderate<br>none<br>no odor | 1t. brown<br>moderate<br>minimal<br>slight<br>moderate<br>none<br>no odor | many clouds<br>no rain<br>small<br>warm<br>NE |   |  |

TABLE 4. . FIELD OBSERVATIONS, ASHLEY LAKE, WASHINGTON COUNTY, ILLINOIS.

| DATE     | OBSERVATION   | SITE 1  | SITE 2  | SITE 3  | WEATHER AT LAKE   | PRESENT  | PRECEDING 24 HOURS                          | OTHER COMMENTS   |
|----------|---|---|---|---|---|--|---|--|
| 9/4/81   | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | lt. brown<br>moderate<br>minimal<br>minimal<br>minimal<br>none<br>no odor | brnsh.-grn<br>slight<br>minimal<br>minimal<br>moderate<br>none<br>no odor | grn-brn<br>minimal<br>minimal<br>minimal<br>slight<br>none<br>no odor     | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | many clouds<br>no rain<br>ripple<br>warm<br>NE | overcast<br>no rain<br>ripple<br>warm<br>NE | WATER LEVEL OF LAKE: above normal<br>RECREATIONAL USAGE: none<br><br>LAKE MANAGEMENT: none<br>ADDITIONAL COMMENTS:   |
| 9/28/81  | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | brnsh-grn<br>moderate<br>minimal<br>minimal<br>minimal<br>none<br>no odor | grnsh-brn<br>moderate<br>minimal<br>slight<br>moderate<br>none<br>no odor | brnsh-grn<br>moderate<br>minimal<br>minimal<br>minimal<br>none<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | few clouds<br>no rain<br>ripple<br>cold<br>SW  | no rain<br>ripple<br>cold<br>SW             | WATER LEVEL OF LAKE: (12" below dam)<br>above normal<br>RECREATIONAL USAGE: fishing<br><br>LAKE MANAGEMENT: 9/23/81 500# CUS04<br>ADDITIONAL COMMENTS: algae control |
| 10/6/81  | WATER COLOR;<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>slight<br>minimal<br>minimal<br>minimal<br>none<br>no odor   | grn-brn<br>slight<br>minimal<br>minimal<br>slight<br>none<br>no odor      | grn-brn<br>slight<br>minimal<br>minimal<br>moderate<br>none<br>no odor    | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | overcast<br>no rain<br>ripple<br>warm<br>SW    | clear<br>no rain<br>ripple<br>warm<br>SW    | WATER LEVEL OF LAKE: normal<br>RECREATIONAL USAGE: none<br><br>LAKE MANAGEMENT: 9/23/81 500# CUS04<br>applied for algae control<br>ADDITIONAL COMMENTS:              |
| 10/25/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | brnsh-grn<br>moderate<br>minimal<br>minimal<br>minimal<br>none<br>no odor | grnsh-brn<br>slight<br>minimal<br>minimal<br>slight<br>none<br>no odor    | grn-brn<br>moderate<br>minimal<br>minimal<br>moderate<br>none<br>no odor  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | overcast<br>no rain<br>ripple<br>cool<br>S     | clear<br>no rain<br>ripple<br>cool<br>SW    | WATER LEVEL OF LAKE: normal<br>RECREATIONAL USAGE: none<br><br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS:  |

Field observations indicate that the transparency of Ashley Lake is influenced by both algae and suspended sediment. A greenish-brown water color was most often observed, moderate amounts of algae and sediment were noted on several sampling dates, and the lake was routinely treated with copper sulfate to control algae.

### Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Ashley Lake (estimated at twice the Secchi depth) ranged from 1.8 - 6.0 feet at Site 1, 2.0 - 5.0 feet at Site 2, and 1.7 - 5.0 feet at Site 3. Since Site 1 was deep enough to thermally stratify and generally had a euphotic zone less than the total depth, low dissolved oxygen values would be expected in the bottom waters during summer stratification.

In the absence of dissolved oxygen, undesirable substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese accumulate in the bottom waters. These substances can contribute to serious taste and odor problems in drinking water if water supply is taken from near the lake bottom during summer stratification. When the substances which have accumulated in the bottom waters during stratification periods are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

### SUMMARY AND RECOMMENDATIONS

#### Summary

Ashley Lake, a small public water supply and recreational impoundment in southern Illinois, was sampled on 11 dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Ronald Schaefer recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Ashley Lake (21.8 inches) ranked 61st of the 87 lakes monitored by volunteers in 1981 (rank 1 is nearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health and was in the range generally associated with use impairment problems for Illinois lakes.

Above normal rainfall during the 1981 sampling period may have contributed to a lower than normal transparency. Transparency was influenced by both sediment and algae and lowest Secchi readings were recorded in mid-spring.

Ashley Lake is undergoing the process of eutrophication as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

### Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens, reduce the need for copper sulfate, and improve fishing. Harvesting of aquatic weeds might also be considered.

Continued monitoring is recommended for Ashley Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

#### REFERENCES

Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

Illinois Department of Public Health. 1976. The Minimum Sanitary Requirements for the Design and Operation of Swimming Pools and Bathing Beaches. State of Illinois, Department of Public Health, Springfield, Illinois.

Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

DS:jab/sp2161c

## GLOSSARY\*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

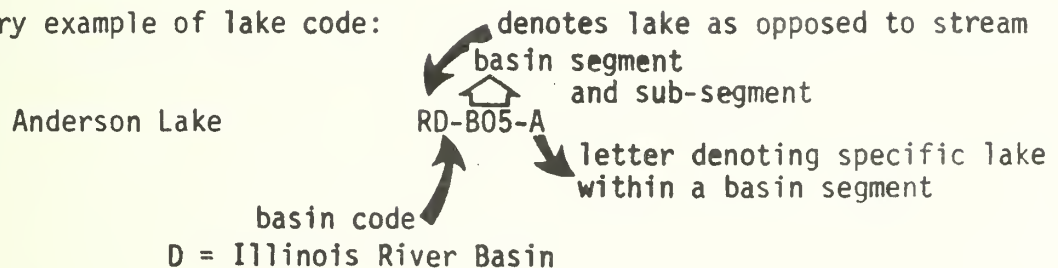
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

## ABBREVIATIONS AND SYMBOLS

av - average  
brn - brown  
brnsh-grn - brownish-green  
grn-brn - green-brown  
grnsh-brn - greenish-brown  
lt - light  
max - maximum value  
min - minimum value  
mod - moderately  
std. dev. - standard deviation  
v - very

Explanatory example of lake code:



\*Definitions of items in sense used in text

DS:sp,6207a,1-8





UNIVERSITY OF ILLINOIS-URBANA  
551.482V889X C002  
VOLUNTEER LAKE MONITORING PROGRAM SPRIN  
1981:4



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551.482  
V889x  
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Crg. 2

Nat. Hist. Surv.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY  
DIVISION OF WATER POLLUTION CONTROL  
2200 CHURCHILL ROAD  
SPRINGFIELD, ILLINOIS 62706



## 1981 VOLUNTEER LAKE

## MONITORING PROGRAM REPORT



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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT  
FOR  
ARBOR LAKE, DUPAGE COUNTY, ILLINOIS

A Cooperative Citizen -  
Illinois Environmental Protection Agency  
Project

May, 1982  
Illinois Environmental Protection Agency  
2200 Churchill Road  
Springfield, Illinois 62706

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Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

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## INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have available a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

## BACKGROUND

Arbor Lake is a 14.7 acre borrow pit lake located on the grounds of Morton Arborstum, DuPage County, Illinois. The lake, which was constructed in 1957, has a maximum depth of 25 feet, an average depth of 17 feet, a storage capacity of 249.9 acre/feet, and a water retention time of 7 years (Table 1).

Arbor Lake receives light recreational usage for fishing, swimming, canoeing, row boating, sailboating, picnicking, waterfowl observation, and waterskiing. There is no public boat ramp or other recreational facilities available.

The watershed and shoreline of Arbor Lake are estimated to be 75% woodland. The general water quality is rated excellent and fishing fair by volunteer Michael O'Brien. Moderate problems at the lake are associated with sediment deposition, algal blooms, aquatic weeds, and fishkills. Potential pollution sources include urban storm drainage, pasture and grassland runoff, fertilizers and pesticides from lawns, and waterfowl.

No chemical treatments have ever been employed at Arbor Lake. The lake has been stocked periodically with northern pike and small mouth bass.

TABLE 1. LAKE ASSESSMENT SUMMARY, ARBOR LAKE, DU PAGE COUNTY, ILLINOIS (RG-A08ZI).

## I. GENERAL INFORMATION

River Basin: Des Plaines  
Segment: A08  
Latitude:  
Longitude:  
Ownership: Morton Arboretum

Surface Area (Acres): 14.7  
Watershed Area (Acres): 50  
Maximum Depth (Feet): 25  
Average Depth (Feet): 17  
Storage Capacity (Acre/Feet): 249.9  
Inflowing Stream(s): none  
Outflowing Stream(s): none  
Water Retention Time: 7.059 years  
Lake Type: borrow pit  
Year Constructed: 1957

## II. USAGE

Public Access: no

### Lake Usage:

Potable Water Supply: none  
Industrial Water Supply: none  
Agricultural Water Supply: none  
Cooling Water: none  
Recreation: light  
Fishing: light  
Swimming: light  
Power Boating: none  
Row Boating or Canoeing: light  
Sailboating: light  
Camping: none  
Picnicking: light  
Waterfowl Hunting: none  
Waterfowl Observation: light  
Other: waterskiing - light

Recreational Facilities:  
none

### Shoreline Usage (Percent):

Urban (Including Streets):  
Residential (Including Lawns):  
Golf Courses:  
Pasture or Grassland: 25%  
Woodland: 75%  
Row Crops:  
Wetland:  
Other:

### Watershed Usage (Percent):

Urban:  
Residential: 10%  
Golf Courses:  
Pasture or Grassland: 15%  
Woodland: 75%  
Row Crops:  
Wetland:  
Other:

## III. WATER QUALITY AND PROBLEMS

General Water Quality: excellent  
Fishing: fair

### Conditions and Extent:

Suspended Sediment: minimal  
Deposition of Sediment: moderate  
Algal Blooms: moderate  
Aquatic Weeds: moderate  
Taste and/or Odor: minimal  
Water Level Fluctuation: slight  
Fishkills: moderate  
Other:

## IV. CAUSES OF WATER QUALITY PROBLEMS

### Potential Pollution Sources:

Sewage Treatment Plant Effluent:  
Industrial Discharge:  
Urban Storm Drainage: yes  
Septic Tanks:  
Pasture or Grassland Runoff: yes  
Cropland Runoff:  
Feedlot Runoff:  
Construction Site Runoff:  
Fertilizer or Pesticides from  
Lawns/Golf Courses: yes  
Orchards:  
Forestry Operations Runoff:  
Mining:  
Waterfowl: yes (15 - 20 resident Canadian Geese)  
Sediment in Lake:  
Other:

## V. LAKE MANAGEMENT

Comments: Lake has been periodically stocked (northern  
pike; small mouth bass); no chemical treatments employed

\*Information Supplied By Michael O'Brien (1981)

Assessment information on Arbor Lake was provided by Michael O'Brien. Monitoring was performed by Michael O'Brien and Patricia Suffredin. Secchi disc transparency, total depth, and field observations were recorded at three sites (located in Fig. 1) on five dates in 1981.

## RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report, "Volunteer Lake Monitoring, 1981", Section IV, "Understanding Illinois' Lakes".

The Secchi monitoring data for Arbor Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3 while field observations are summarized in Table 4.

### Transparency of Arbor Lake

The average Secchi disc transparency of Arbor Lake was 137.8 inches, which ranked number 1 when the average transparencies of the lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was greater than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was above average for Illinois lakes.

### Spatial and Seasonal Differences in Transparency

Secchi disc measurements for Arbor Lake ranged from a minimum of 84 inches at Site 1 on June 14 to a maximum of 252 inches at that site on April 26 and May 2. The average transparencies were 162.0 inches, 146.8 inches and 104.0 inches at Sites 1, 2, and 3, respectively. Field observations of a clear to brownish-green water color indicated that transparency was influenced by algae.

Since readings were only taken on five days from April through July, seasonal differences in the transparency of Arbor Lake could not be completely described. Highest transparencies were recorded in late April and early May, and decreased thereafter. If readings had been during later summer the average transparency of this lake may have been lower.

### Relationship to Lake Uses

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

FIGURE 1  
ARBOR LAKE  
DUPAGE COUNTY

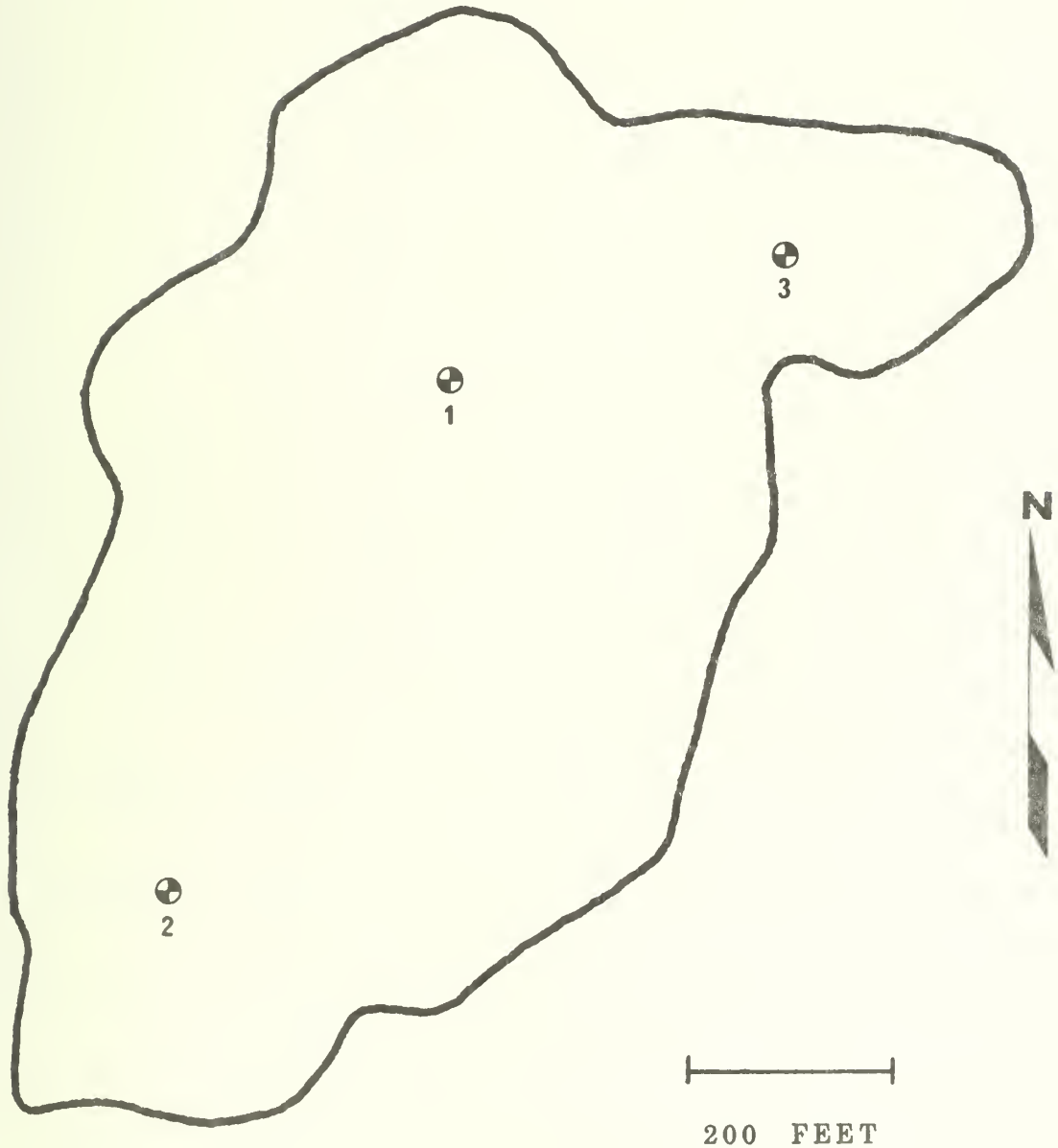


TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) ARBOR/DUPAGE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

| DATE   | SITE 1 | SITE 2 | SITE 3 | MEAN  | STD DEV |
|--------|--------|--------|--------|-------|---------|
| 04/ 26 | 252.0  | 284.0  | 188.0  | 188.0 | 73.3    |
| 05/ 2  | 252.0  | 284.0  | 188.0  | 188.0 | 73.3    |
| 05/ 30 | 86.0   | 184.0  | 110.0  | 183.3 | 7.0     |
| 06/ 14 | 84.0   | 90.0   | 90.0   | 86.0  | 3.5     |
| 07/ 5  | 126.0  | 132.0  | 188.0  | 122.0 | 12.5    |

\*\*\*SUMMARY STATISTICS\*\*\*

LAKE

SITES

|          |       |       |       |       |
|----------|-------|-------|-------|-------|
| MEAN     | 162.0 | 146.8 | 104.0 | 137.0 |
| STD DEV  | 83.6  | 54.4  | 8.3   | 59.0  |
| MIN      | 84.0  | 90.0  | 90.0  | 84.0  |
| MAX      | 252.0 | 284.0 | 110.0 | 252.0 |
| AV DEPTH | 21.0  | 17.1  | 9.0   |       |

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) ARBOR/DUPAGE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

| DATE   | SITE 1 | SITE 2 | SITE 3 | MEAN | STD DEV |
|--------|--------|--------|--------|------|---------|
| 04/ 26 | 21.0   | 17.0   | 9.0    | 15.7 | 6.1     |
| 05/ 2  | 21.0   | 17.0   | 9.0    | 15.7 | 6.1     |
| 05/ 30 | 21.0   | 17.0   | 9.0    | 15.7 | 6.1     |
| 06/ 14 | 21.0   | 17.5   | 9.0    | 15.8 | 6.2     |
| 07/ 5  | 21.0   | 17.0   | 9.0    | 15.7 | 6.1     |

\*\*\*SUMMARY STATISTICS\*\*\*

LAKE

SITES

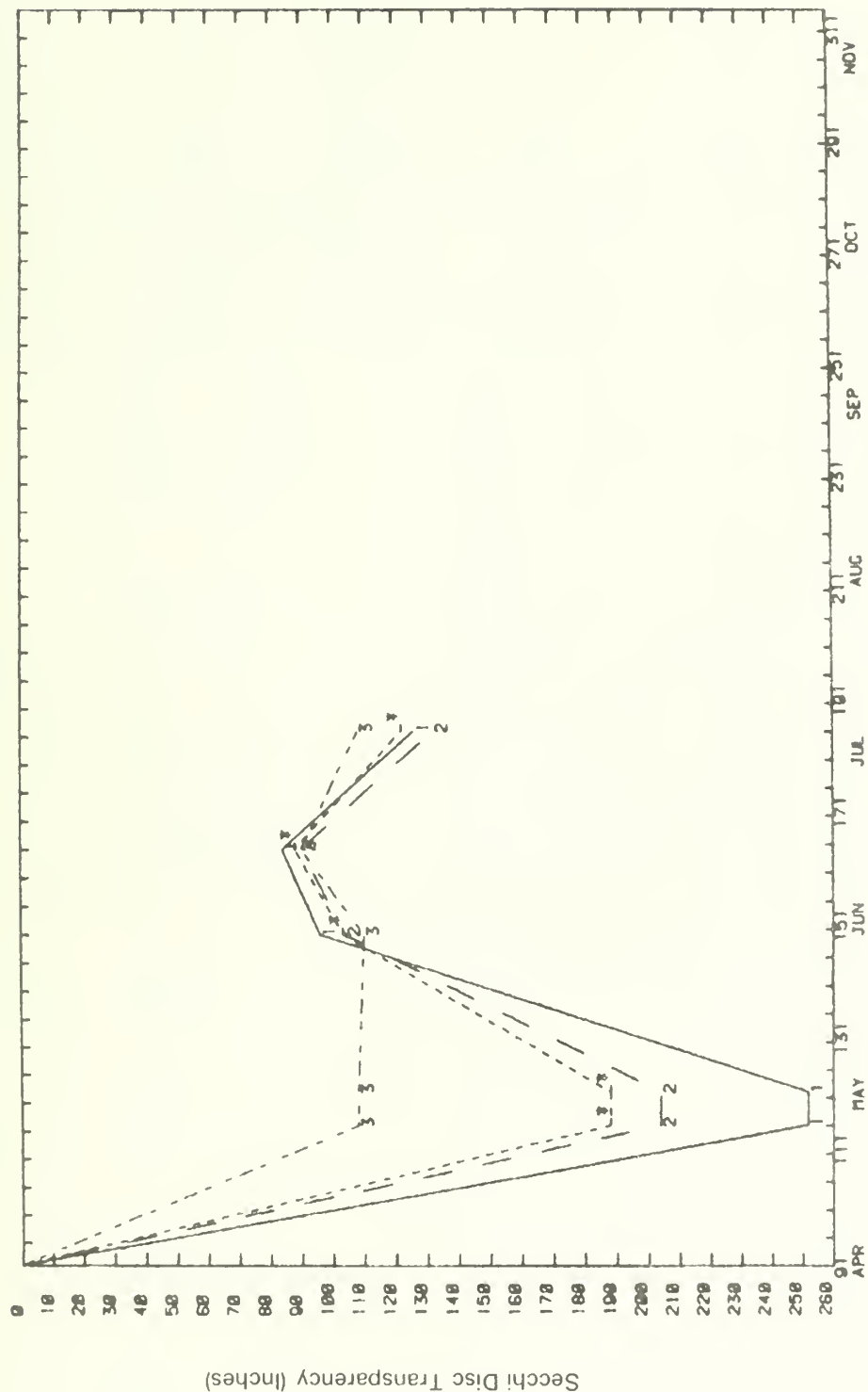
|          |      |      |     |      |
|----------|------|------|-----|------|
| MEAN     | 21.0 | 17.1 | 9.0 | 15.7 |
| STD DEV  | 0.0  | 0.2  | 0.0 | 5.2  |
| MIN      | 21.0 | 17.0 | 9.0 | 9.0  |
| MAX      | 21.0 | 17.5 | 9.0 | 21.0 |
| AV DEPTH | 21.0 | 17.1 | 9.0 |      |

-1 = missing value

See glossary for explanation of Summary Statistics.

# FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) ARBOR/DUPAGE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



## KEY

- 1 Site 1
- 2 Site 2
- 3 Site 3
- . Mean (Average)

Day of Year

TABLE 4. FIELD OBSERVATIONS, ARBOR LAKE, DUPAGE COUNTY, ILLINOIS.

| DATE   | OBSERVATION   | SITE 1  | SITE 2  | SITE 3   | WEATHER AT LAKE   | PRESENT   | PRECEDING 24 HOURS                                | OTHER COMMENTS  |
|--|---|---|---|--|---|---|---|---|
| 3/26/81                                      | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | clear<br>minimal<br>slight<br>moderate<br>waterfowl<br>*<br>no odor | clear<br>minimal<br>minimal<br>slight<br>moderate<br>*<br>no odor | clear<br>minimal<br>moderate<br>large<br>waterfowl<br>*<br>no odor               | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | few clouds<br>no rain<br>calm<br>cool<br>EW     | clear<br>no rain<br>calm<br>cool<br>N             | WATER LEVEL OF LAKE: below normal 34"<br>RECREATIONAL USAGE: fishing<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS: 1 small mouth bass 4" caught in seine, several hybrid bluegills, 10-15 painted turtles, 1 Can. goose   |
| *Phytoplankton, zooplankton blue green algae |   |   |   |  |   |   |   |   |
| DATE   | OBSERVATION   | SITE 1  | SITE 2  | SITE 3   | WEATHER AT LAKE   | PRESENT   | PRECEDING 24 HOURS                                | OTHER COMMENTS  |
| 5/2/81                                       | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | clear<br>minimal<br>minimal<br>slight<br>moderate<br>*<br>no odor   | clear<br>minimal<br>minimal<br>moderate<br>*<br>no odor           | clear<br>minimal<br>minimal<br>moderate<br>waterfowl<br>** duckweed<br>fishy     | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | clear<br>no rain<br>ripple<br>hot<br>SW         | clear<br>no rain<br>calm<br>very hot<br>SW        | WATER LEVEL OF LAKE: below normal 30"<br>RECREATIONAL USAGE: none<br><br>LAKE MANAGEMENT: none<br><br>ADDITIONAL COMMENTS: 15 Canadian geese with young, duckweed increased near Site #3, bluegill, green sunfish hybrids captured. Mayfly & dragonfly larvae abundant. Great blue heron spotted near Site #2 |
| **algal colonies                             |   |   |   |  |   |   |   |   |
| DATE   | OBSERVATION   | SITE 1  | SITE 2  | SITE 3   | WEATHER AT LAKE   | PRESENT   | PRECEDING 24 HOURS                                | OTHER COMMENTS  |
| 5/30/81                                      | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | brnsh-grn<br>slight<br>minimal<br>minimal<br>large<br>*<br>no odor  | grn-brn<br>slight<br>slight<br>moderate<br>large<br>*<br>no odor  | grnsh-brn<br>slight<br>moderate<br>moderate<br>large<br>*<br>fishy               | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | overcast<br>no rain<br>small<br>cool<br>N-15mph | hazy<br>no rain<br>ripple<br>warm<br>N-3mph       | WATER LEVEL OF LAKE: above normal 39"<br>RECREATIONAL USAGE: fishing<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS:  |
| *zooplankton, phytoplankton                  |   |   |   |  |   |   |   |   |
| DATE   | OBSERVATION   | SITE 1  | SITE 2  | SITE 3   | WEATHER AT LAKE   | PRESENT   | PRECEDING 24 HOURS                                | OTHER COMMENTS  |
| 6/14/81                                      | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | brnsh-grn<br>minimal<br>minimal<br>minimal<br>large<br>*<br>no odor | grn-brn<br>slight<br>moderate<br>slight<br>large<br>*<br>no odor  | grn-brn<br>slight<br>moderate<br>moderate<br>large<br>algal mats<br>*<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | overcast<br>no rain<br>moderate<br>warm<br>NE   | overcast<br>mod. rain<br>white caps<br>warm<br>NE | WATER LEVEL OF LAKE: above normal 45"<br>RECREATIONAL USAGE: fishing<br><br>LAKE MANAGEMENT: none<br><br>ADDITIONAL COMMENTS: Bluegill feeding has stopped, algae growth has increased again, water is warming up. 82°F   |

TABLE 4. FIELD OBSERVATIONS, ARBOR LAKE, DUPAGE COUNTY, ILLINOIS.

| DATE                        | OBSERVATION   | SITE  |   |   | SITE 3 | WEATHER AT LAKE   |                                      | PRESENT         | PRECEDING<br>24 HOURS                             | OTHER COMMENTS  |
|-----------------------------|---|---|---|---|--------|---|--------------------------------------|-----------------|---|---|
| 7/5/81                      | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | brnsh-grn<br>minimal<br>slight<br>slight<br>moderate<br>* | grn-brn<br>minimal<br>slight<br>slight<br>moderate<br>* | grn-brn<br>minimal<br>minimal<br>large<br>* | fishy  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | hazy<br>no rain<br>calm<br>hot<br>SW | Michael O'Brien | few clouds<br>no rain<br>ripple<br>very hot<br>SW | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS: 1 striped top<br>minnow caught in vegetative bay. |
| *phytoplankton, zooplankton |   |   |   |   |        |   |                                      |                 |   |   |
| DATE                        | OBSERVATION   | SITE  |   |   | SITE 3 | WEATHER AT LAKE   |                                      | PRESENT         | PRECEDING<br>24 HOURS                             | OTHER COMMENTS  |
|                             | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: |   |   |   |        | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: |                                      |                 |   | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS:   |
| ⊕                           |   |   |   |   |        |   |                                      |                 |   |   |
| DATE                        | OBSERVATION   | SITE  |   |   | SITE 3 | WEATHER AT LAKE   |                                      | PRESENT         | PRECEDING<br>24 HOURS                             | OTHER COMMENTS  |
|                             | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: |   |   |   |        | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: |                                      |                 |   | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS:   |
| DATE                        | OBSERVATION   | SITE  |   |   | SITE 3 | WEATHER AT LAKE   |                                      | PRESENT         | PRECEDING<br>24 HOURS                             | OTHER COMMENTS  |
|                             | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: |   |   |   |        | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: |                                      |                 |   | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS:   |

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Arbor Lake (estimated at twice the Secchi depth) ranged from 14.0 - 21.0 feet at Site 1, from 15.0 - 17.0 feet at Site 2, and 7.5 - 9.0 feet at Site 3. Since the euphotic zone generally extended to the bottom of Arbor Lake, the bottom waters would probably remain oxygenated during summer stratification.

## SUMMARY AND RECOMMENDATIONS

### Summary

Arbor Lake, a borrow pit in northeastern Illinois, was sampled on five dates between April 26 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers Michael O'Brien and Patricia Suffredin recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Arbor Lake was 137.8 inches, which ranked first of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest, 87 is least transparent). This average transparency was greater than the four feet minimum recommended for swimming by the Department of Public Health and was above average for Illinois lakes.

Arbor Lake is undergoing the process of eutrophication, as evidenced by field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment inputs were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

### Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information of lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to prevent the development of severe problems.

Installation of Resource Management Systems in identified source areas of the watershed, particularly those closest to the lake, may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Harvesting of aquatic weeds might also be considered.

Continued monitoring is recommended for Arbor Lake. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake watershed management strategies.

#### REFERENCES

Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

Illinois Department of Public Health. 1976. The Minimum Sanitary Requirements for the Design and Operation of Swimming Pools and Bathing Beaches. State of Illinois, Department of Public Health, Springfield, Illinois.

Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

DS:jab/sp4563C

## GLOSSARY\*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

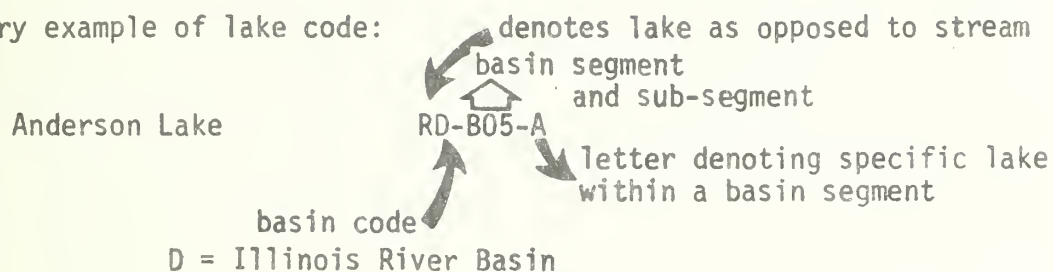
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

## ABBREVIATIONS AND SYMBOLS

av - average  
brn - brown  
brnsh-grn - brownish-green  
grn-brn - green-brown  
grnsh-brn - greenish-brown  
lt - light  
max - maximum value  
min - minimum value  
mod - moderately  
std. dev. - standard deviation  
v - very

Explanatory example of lake code:



\*Definitions of items in sense used in text

DS:sp,6207a,1-8





UNIVERSITY OF ILLINOIS-URBANA  
551 482V889X C002  
VOLUNTEER LAKE MONITORING PROGRAM SPRIN  
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SPRINGFIELD, ILLINOIS 62706



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## 1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT



CANYON LAKE 20 DAVIES W.



1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT  
FOR  
APPLE CANYON LAKE, JO DAVIESS COUNTY, ILLINOIS

A Cooperative Citizen -  
Illinois Environmental Protection Agency  
Project

May, 1982  
Illinois Environmental Protection Agency  
2200 Churchill Road  
Springfield, Illinois 62706

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## ACKNOWLEDGEMENTS

This is one of 87 reports prepared for lakes in the 1981 Volunteer Lake Monitoring Program. It represents the coordinated effort of many individuals.

Illinois EPA's Ambient Monitoring Unit, Planning Section, Division of Water Pollution Control, under the direction of Kenneth R. Rogers, was responsible for the design and implementation of the program, as well as preparation of this report. Substantial assistance was provided by the Agency's Public Participation Section supervised by Gloria Craven.

Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

Volunteers were trained by Public Participation Coordinators Carol Beim, Bob Hagele, William Hammel, Patrick McCarthy, Vanessa Musgrave, and Dawn Wrobel. Lake maps were prepared by J. W. Hammel and Bob Hagele. Lake assessment summaries were prepared by Patrick McCarthy.

Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

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## INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have available a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

## BACKGROUND

Apple Canyon Lake is a 480 acre impoundment owned by the Apple Canyon Lake Organization, Jo Daviess County, Illinois. The lake was constructed by damming Hells Branch in 1969. It has a maximum depth of 70 feet, an average depth of 30 feet, and a storage capacity of 14,400 acre-feet (Table 1).

Apple Canyon Lake serves as a recreational lake, used primarily for fishing, swimming, power boating, row boating, canoeing, sailboating, camping and picnicking. Access is limited to organization members only.

Aquatic weeds are considered a moderate problem in Apple Canyon Lake. Septic tanks, pasture or grassland runoff, and cropland runoff are cited as sources of pollution.

Lake assessment information was provided by the Illinois Department of Conservation (1977). Monitoring was performed by J. Scott Eversoll. Secchi disc depth, total depth and field observations were recorded at three sites (located in Fig. 1) on two dates in 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, APPLE CANYON LAKE, JODAVIESS COUNTY, ILLINOIS (RM-A01-J).

I. GENERAL INFORMATION

River Basin: Mississippi North  
Segment: A01

Ownership: organizational

Surface Area (Acres): 480.0  
Watershed Area (Acres): 13,000  
Maximum Depth (Feet): 70.0  
Average Depth (Feet): 30.0  
Storage Capacity (Acre/Feet): 14,400  
Inflowing Stream(s): Hells Branch  
Outflowing Stream(s): Hells Branch  
Water Retention Time: 1.662 year  
Lake Type: dammed stream  
Year Constructed: 1969

II. USAGE

Public Access: no

Lake Usage:

Potable Water Supply:  
Industrial Water Supply:  
Agricultural Water Supply:  
Cooling Water:  
Recreation:  
Fishing: X  
Swimming: X  
Power Boating: X  
Row Boating or Canoeing: X  
Sailboating: X  
Camping: X  
Picnicking: X  
Waterfowl Hunting:  
Waterfowl Observation:  
Other:

Recreational Facilities:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Shoreline Usage (Percent):

Urban (Including Streets):  
Residential (Including Lawns):  
Golf Courses:  
Pasture or Grassland:  
Woodland:  
Row Crops:  
Wetland:  
Other:

Watershed Usage (Percent):

Urban:  
Residential:  
Golf Courses:  
Pasture or Grassland:  
Woodland:  
Row Crops:  
Wetland:  
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: excellent  
Fishing:  
Conditions and Extent:  
Suspended Sediment: slight  
Deposition of Sediment: slight  
Algal Blooms: slight  
Aquatic Weeds: moderate  
Taste and/or Odor: slight  
Water Level Fluctuation: slight  
Fishkills: minimal  
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent:  
Industrial Discharge:  
Urban Storm Drainage:  
Septic Tanks: X  
Pasture or Grassland Runoff: X  
Cropland Runoff: X  
Feedlot Runoff:  
Construction Site Runoff:  
Fertilizer or Pesticides from  
Lawns/Golf Courses:  
Orchards:  
Forestry Operations Runoff:  
Mining:  
Waterfowl:  
Sediment in Lake:  
Other:

V. LAKE MANAGEMENT

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Information Supplied By Illinois Department of Conservation (1977)

FIGURE 1  
APPLE CANYON LAKE  
JODAVIESS COUNTY



## RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Apple Canyon Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

### Transparency of Apple Canyon Lake

The average transparency of Apple Canyon Lake was 47.3 inches, which ranked 25th when the lakes were ranked by average transparency from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was slightly less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976). However, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

### Spatial and Seasonal Differences in Transparency

Secchi disc measurements for Apple Canyon Lake were taken on only two dates. They ranged from a minimum of 20 inches at Site 3 on June 22 to a maximum of 78 inches at Site 1 on the same date.

As is typical of Illinois reservoirs, a spatial trend of increasing transparency from the lake headwaters to the dam was apparent in Apple Canyon Lake. The average transparencies of Sites 3, 2, and 1 (headwaters to dam) were 31.0 inches, 48.0 inches and 63.0 inches, respectively.

Field observations indicate that the transparency of Apple Canyon Lake is influenced primarily by suspended sediment at Site 3 and by algae at Site 1. The sediment load tends to settle out in the upper end of the lake so that the water becomes clearer towards the dam. This is evidenced by the change in water color from brown at Site 3 to green at Site 1. The amount of suspended sediment was observed to be higher at Site 3 than at Sites 1 and 2, while the amount of algae was noted to be the same at all three sites.

Since Secchi readings were not taken from July through October, seasonal differences in the transparency of Apple Canyon Lake could not be determined.

TABLE 2

SECOND DISC TRANSPARENCY (INCHES) APPLE CANYON/JO DAVIESS COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

| DATE                     | SITE 1   | SITE 2 | SITE 3 | MEAN | STD DEV |
|--------------------------|----------|--------|--------|------|---------|
| 05/ 2                    | 48.0     | 42.0   | 42.0   | 44.0 | 3.5     |
| 06/ 22                   | 78.0     | 54.0   | 20.0   | 50.7 | 20.1    |
| ***SUMMARY STATISTICS*** |          |        |        |      |         |
|                          | SITES    |        |        |      |         |
|                          | MEAN     | 63.0   | 48.0   | 31.0 | 47.3    |
|                          | STD DEV  | 21.2   | 8.5    | 15.6 | 18.0    |
|                          | MIN      | 48.0   | 42.0   | 20.0 | 20.0    |
|                          | MAX      | 78.0   | 54.0   | 42.0 | 78.0    |
|                          | AV DEPTH | 52.0   | 45.5   | 4.5  |         |
|                          | LAKE     |        |        |      |         |

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) APPLE CANYON/JO DAVIESS COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

| DATE                     | SITE 1   | SITE 2 | SITE 3 | MEAN | STD DEV |
|--------------------------|----------|--------|--------|------|---------|
| 05/ 2                    | 50.0     | 40.0   | 4.5    | 31.0 | 23.0    |
| 06/ 22                   | 54.0     | 51.0   | 4.5    | 36.5 | 27.0    |
| ***SUMMARY STATISTICS*** |          |        |        |      |         |
|                          | SITES    |        |        |      |         |
|                          | MEAN     | 52.0   | 45.5   | 4.5  | 34.0    |
|                          | STD DEV  | 2.0    | 7.0    | 0.0  | 23.3    |
|                          | MIN      | 50.0   | 40.0   | 4.5  | 4.5     |
|                          | MAX      | 54.0   | 51.0   | 4.5  | 54.0    |
|                          | AV DEPTH | 52.0   | 45.5   | 4.5  |         |
|                          | LAKE     |        |        |      |         |

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) APPLE CANYON/JD DAVIESS COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

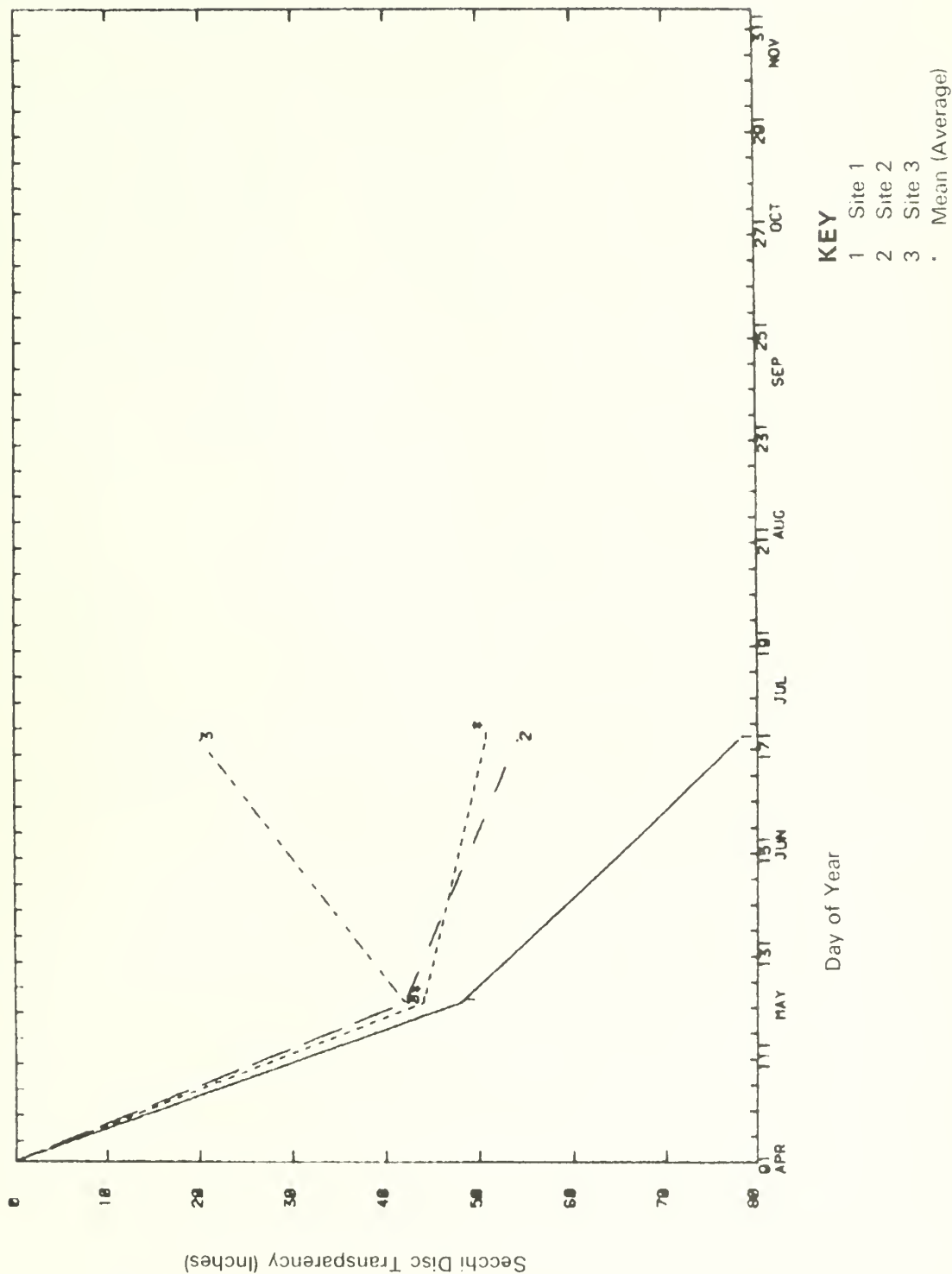


TABLE 4. FIELD OBSERVATIONS, APPLE CANYON LAKE, JO DAVIESS COUNTY, ILLINOIS.

| DATE    | OBSERVATION   | PRECEDING 24 HOURS   |  |  |  | OTHER COMMENTS   |
|---------|---|--|--|--|--|--|
|         |   | SITE 1   | SITE 2   | SITE 3   | WEATHER AT LAKE<br>CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | PRESENT  |
| 5/2/81  | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | lt. green<br>minimal<br>slight<br>minimal<br>minimal<br>none<br>no odor    | lt. green<br>minimal<br>slight<br>minimal<br>minimal<br>none<br>no odor    | lt. green<br>moderate<br>slight<br>minimal<br>slight<br>algal mats<br>no odor                | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:                    | few clouds<br>no rain<br>ripple<br>cool<br>S<br>J. Scott Eversoll<br>OBSERVATIONS MADE BY:   |
|         |   |  |  |  | many clouds<br>no rain<br>small<br>cold<br>N   | WATER LEVEL OF LAKE: above normal 6"<br>RECREATIONAL USAGE: fishing, power boating, camping, picnicking<br>LAKE MANAGEMENT: 5/1/81<br>5,000 channel catfish<br>ADDITIONAL COMMENTS:  |
| DATE    | OBSERVATION   | PRECEDING 24 HOURS   |  |  |  | OTHER COMMENTS   |
|         |   | SITE 1   | SITE 2   | SITE 3   | WEATHER AT LAKE<br>CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | PRESENT  |
| 6/22/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | mod. green<br>moderate<br>moderate<br>minimal<br>slight<br>none<br>no odor | mod. green<br>moderate<br>moderate<br>minimal<br>slight<br>none<br>no odor | mod. brown<br>large<br>moderate<br>moderate<br>moderate<br>algal mats<br>duckweed<br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:                    | clear<br>no rain<br>small<br>warm<br>S<br>J. Scott Eversoll<br>OBSERVATIONS MADE BY:   |
|         |   |  |  |  | clear<br>no rain<br>ripple<br>warm<br>W  | WATER LEVEL OF LAKE: above normal 6"<br>RECREATIONAL USAGE: fishing, swimming, waterskiing, row boating/canoeing, camping, picnicking<br>LAKE MANAGEMENT: June 11, Diquat 50 gal<br>cutrine 35 gal. - control weeds & algae<br>ADDITIONAL COMMENTS: Flood conditions last week |
| DATE    | OBSERVATION   | PRECEDING 24 HOURS   |  |  |  | OTHER COMMENTS   |
|         |   | SITE 1   | SITE 2   | SITE 3   | WEATHER AT LAKE<br>CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | PRESENT  |
|         | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: |  |  |  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:                    |  |
|         |   |  |  |  |  | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS:  |
| DATE    | OBSERVATION   | PRECEDING 24 HOURS   |  |  |  | OTHER COMMENTS   |
|         |   | SITE 1   | SITE 2   | SITE 3   | WEATHER AT LAKE<br>CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | PRESENT  |
|         | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: |  |  |  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:                    |  |
|         |   |  |  |  |  | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS:  |

## Relationship to Lake Uses

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Apple Canyon Lake (estimated at twice the Secchi depth) ranged from 8.0-13.0 feet at Site 1, from 7.0-9.0 feet at Site 2, and from 3.3-7.0 feet at Site 3. Since Sites 1 and 2 of Apple Canyon Lake are deep enough to thermally stratify and had euphotic zones that were generally less than the total depths, low dissolved oxygen values would be expected in the bottom waters of these sites..

In the absence of dissolved oxygen, undesirable substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

## SUMMARY AND RECOMMENDATIONS

### Summary

Apple Canyon Lake, a recreational impoundment in northwestern Illinois, was sampled on 2 dates between April 30 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Scott Eversoll recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Apple Canyon Lake (47.3 inches) ranked 25th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). Although this average transparency was less than the four feet recommended for swimming by the Department of Public Health, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Lowest transparencies were recorded in mid-spring; a brownish water color at that time indicated that transparency was influenced primarily by suspended sediment. At other times, a brownish-green to moderately green water color indicated that algae also influenced transparency. There were variations in transparency at all sites; but generally large amounts of sediment and algae were observed at Site 3. Aquatic weed problems were noted at Sites 2 and 3.

Apple Canyon Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Apple Canyon Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment inputs were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

### Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in identified source areas of the watershed, particularly those closest to the lake, may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens, reduce the need for copper sulfate, and improve fishing. Harvesting of aquatic weeds might also be considered.

Continued monitoring is recommended for Apple Canyon Lake. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

#### REFERENCES

Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

Illinois Department of Public Health. 1976. The Minimum Sanitary Requirements for the Design and Operation of Swimming Pools and Bathing Beaches. State of Illinois, Department of Public Health, Springfield, Illinois.

Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

DS:jab/sp3873C

## GLOSSARY\*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

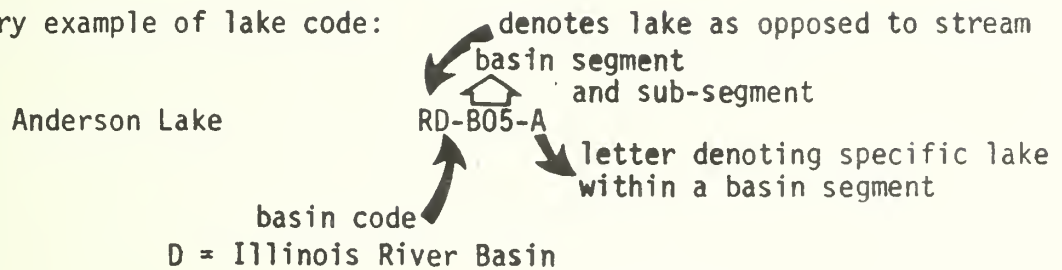
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

## ABBREVIATIONS AND SYMBOLS

av - average  
brn - brown  
brnsh-grn - brownish-green  
grn-brn - green-brown  
grnsh-brn - greenish-brown  
lt - light  
max - maximum value  
min - minimum value  
mod - moderately  
std. dev. - standard deviation  
v - very

Explanatory example of lake code:



\*Definitions of items in sense used in text

DS:sp,6207a,1-8





UNIVERSITY OF ILLINOIS-URBANA  
551 482V889X C002  
VOLUNTEER LAKE MONITORING PROGRAM SPRIN  
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V889x  
1981:1  
exp. 2

Nat. Hist. Serv.

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## 1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT  
FOR  
ALTAMONT NEW LAKE, EFFINGHAM COUNTY, ILLINOIS

A Cooperative Citizen-  
Illinois Environmental Protection Agency  
Project

May, 1982  
Illinois Environmental Protection Agency  
2200 Churchill Road  
Springfield, Illinois 62706

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## ACKNOWLEDGEMENTS

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Illinois EPA's Ambient Monitoring Unit, Planning Section, Division of Water Pollution Control, under the direction of Kenneth R. Rogers, was responsible for the design and implementation of the program, as well as preparation of this report. Substantial assistance was provided by the Agency's Public Participation Section supervised by Gloria Craven.

Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

Volunteers were trained by Public Participation Coordinators Carol Beim, Bob Hagele, William Hammel, Patrick McCarthy, Vanessa Musgrave, and Dawn Wrobel. Lake maps were prepared by J. W. Hammel and Bob Hagele. Lake assessment summaries were prepared by Patrick McCarthy.

Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

Donna Sefton, Howard Essig, John Little, John Lesnak, Carol Beim, and Bob Hagele wrote portions of the lake reports. Reports were edited by Planning Section and Public Participation staff, particularly Marilyn Budd and Mary Anderson. The contributions of Robert Clarke and Thomas Davenport are recognized.

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## INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

## BACKGROUND

Altamont New Lake is a 57 acre impoundment owned by the City of Altamont, Effingham County, Illinois. The lake, which was constructed by damming Turkey Creek in 1973, has a maximum depth of 38 feet, an average depth of 20 feet and a storage capacity of 1140 acre-feet (Table 1).

Altamont New Lake serves as a potable water supply for the City. During the summer of 1981, the lake was closed to the public due to the stocking of fish and vandalism problems.

The 685 acre watershed of Altamont New Lake is estimated to be 80 percent row crops. The lake shoreline is primarily wooded.

Taste and odor is considered a periodic, substantial problem, while suspended sediment, deposition of sediment, algal blooms, aquatic weeds, and water level fluctuations are considered to be moderate problems for Altamont New Lake. Pasture, grassland, and cropland runoff are cited as major pollution sources.

Assessment and monitoring information for Altamont Lake was provided by Steve Evans, the Water Treatment Plant Manager. Secchi disc depth, total depth, and field observations were recorded at three sites (located in Fig. 1) on nine dates in 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, ALTAMONT NEW LAKE, EFFINGHAM COUNTY, ILLINOIS (RC-A09-J).

I. GENERAL INFORMATION

River Basin: Little Wabash  
Segment: A09

Ownership: City of Altamont

Surface Area (Acres): 57  
Watershed Area (Acres): 685  
Maximum Depth (Feet): 38  
Average Depth (Feet): 20  
Storage Capacity (Acre/Feet): 1140  
Inflowing Stream(s): Turkey Creek  
Outflowing Stream(s): Turkey Creek  
Water Retention Time: 1.902 years  
Lake Type: dammed stream  
Year Constructed: 1973

II. USAGE

Public Access: currently closed to public\*  
Lake Usage:

Potable Water Supply: heavy  
Industrial Water Supply: none  
Agricultural Water Supply: light  
Cooling Water: none  
Recreation: none  
Fishing: none  
Swimming: none  
Power Boating: none  
Row Boating or Canoeing: none  
Sailboating: none  
Camping: none  
Picnicking: none  
Waterfowl Hunting: moderate  
Waterfowl Observation: none  
Other:

Recreational Facilities:  
None at this time

Shoreline Usage (Percent):

Urban (Including Streets):  
Residential (Including Lawns):  
Golf Courses:  
Pasture or Grassland: 20%  
Woodland: 60%  
Row Crops: 20%  
Wetland:  
Other:

Watershed Usage (Percent):

Urban:  
Residential:  
Golf Courses:  
Pasture or Grassland: 20%  
Woodland:  
Row Crops: 80%  
Wetland:  
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good  
Fishing: excellent  
Conditions and Extent:  
Suspended Sediment: moderate  
Deposition of Sediment: moderate  
Algal Blooms: moderate  
Aquatic Weeds: moderate  
Taste and/or Odor: large at times  
Water Level Fluctuation: moderate  
Fishkills: minimal  
Other: high manganese levels

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent:  
Industrial Discharge:  
Urban Storm Drainage:  
Septic Tanks: possible  
Pasture or Grassland Runoff: yes  
Cropland Runoff: yes  
Feedlot Runoff:  
Construction Site Runoff:  
Fertilizer or Pesticides from  
Lawns/Golf Courses:  
Orchards:  
Forestry Operations Runoff:  
Mining:  
Waterfowl: yes  
Sediment in Lake: yes  
Other: woodland runoff

V. LAKE MANAGEMENT

Comments: Copper sulfate treatment for algal growth  
every 15 days as needed in summer - approximately  
400 lbs. per treatment.

\*Due to fish stocking and vandalism.

Information Supplied By Steve Evans (1981)

FIGURE 1  
ALTAMONT LAKE  
EFFINGHAM COUNTY



## RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report, "Volunteer Lake Monitoring, 1981", Section IV, "Understanding Illinois' Lakes."

The Secchi monitoring data for Altamont New Lake are summarized in Table 2 and plotted in Fig. 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

### Transparency of Altamont New Lake

The average Secchi disc transparency of Altamont New Lake was 41.6 inches which ranked 38th when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) but was compatible with most recreational uses.

A lengthy drought preceded the 1981 sampling and the water level of Altamont New Lake was three feet below normal on May 27. Heavy rains in June brought the lake level to one foot above normal on June 23. It remained near normal until mid-August, when the water level began dropping to reach four feet below normal on the October 5 sampling. Above average rainfall in summer of 1981 may have contributed to a lower than normal transparency.

### Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Altamont New Lake ranged from a minimum of 18 inches at Site 3 on August 4 to a maximum of 96 inches at Sites 1 and 2 on October 5.

As is typical of Illinois reservoirs, a spatial trend of increasing transparency from the lake headwaters to the dam was apparent in Altamont New Lake. The average transparencies of Sites 3, 2 and 1 were 32.4, 44.2 and 48.0 inches, respectively.

Secchi values were less than the four feet minimum recommended for swimming on six of the eight sampling dates. The lower Secchi readings at Site 3 were probably related, in part, to the shallow depth of the site (average depth 4.4 feet) and the stirring up of sediment by wind and wave activity. It may also reflect the input of nutrients and sediment from tributary streams.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES), ALTAMONT NEW/EFFINGHAM COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

| DATE   | SITE 1 | SITE 2 | SITE 3 | MEAN | STD DEV |
|--------|--------|--------|--------|------|---------|
| 05/ 27 | 60 0   | 60 0   | 48 0   | 56 0 | 6 0     |
| 06/ 6  | 42 0   | 42 0   | 36 0   | 40 0 | 3 5     |
| 06/ 23 | 30 0   | 24 0   | 22 0   | 25 3 | 4 2     |
| 07/ 13 | 00 0   | 66 0   | 42 0   | 66 0 | 24 0    |
| 07/ 21 | 42 0   | 42 0   | 30 0   | 38 0 | 6 0     |
| 08/ 4  | 24 0   | 20 0   | 18 0   | 20 7 | 3 1     |
| 08/ 13 | 24 0   | 24 0   | 30 0   | 26 0 | 3 5     |
| 08/ 31 | 24 0   | 24 0   | 30 0   | 26 0 | 3 5     |
| 10/ 5  | 06 0   | 06 0   | 36 0   | 76 0 | 34 6    |

\*\*\*SUMMARY STATISTICS\*\*\*

LAKE

SITES

|          |      |      |      |      |
|----------|------|------|------|------|
| MEAN     | 48 0 | 44 2 | 32 4 | 41 6 |
| STD DEV  | 28 1 | 25 6 | 0 3  | 22 7 |
| MIN      | 24 0 | 20 0 | 18 0 | 18 0 |
| MAX      | 06 0 | 06 0 | 48 0 | 06 0 |
| AV DEPTH | 28.7 | 17 4 | 4 4  |      |

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET), ALTAMONT NEW/EFFINGHAM COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

| DATE   | SITE 1 | SITE 2 | SITE 3 | MEAN | STD DEV |
|--------|--------|--------|--------|------|---------|
| 05/ 27 | 27 0   | 15 5   | 4 0    | 15 7 | 11 3    |
| 06/ 6  | 20 5   | 15 0   | 4 0    | 16 2 | 12 0    |
| 06/ 23 | 20 2   | 16 5   | 4 5    | 16 7 | 12 3    |
| 07/ 13 | 28 5   | 18 0   | 4 5    | 17 0 | 12 0    |
| 07/ 21 | 30 0   | 19 0   | 6 0    | 19 3 | 12 0    |
| 08/ 4  | 29 0   | 19 5   | 4 0    | 17 5 | 12 6    |
| 08/ 13 | 20 0   | 19 5   | 5 5    | 18 0 | 11 8    |
| 08/ 31 | 28 0   | 18 0   | 4 0    | 16 7 | 12 1    |
| 10/ 5  | 28 0   | 16 0   | 3 0    | 15 7 | 12 5    |

\*\*\*SUMMARY STATISTICS\*\*\*

LAKE

SITES

|          |      |      |     |      |
|----------|------|------|-----|------|
| MEAN     | 28 7 | 17 4 | 4 4 | 16 9 |
| STD DEV  | 0 0  | 1 7  | 0 0 | 10 2 |
| MIN      | 27 0 | 15 0 | 3 0 | 3 0  |
| MAX      | 30 0 | 19 5 | 6 0 | 30 0 |
| AV DEPTH | 28 7 | 17 4 | 4 4 |      |

-1 = missing value

See glossary for explanation of Summary Statistics

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) ALTAMONT NEW/EFFINGHAM COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

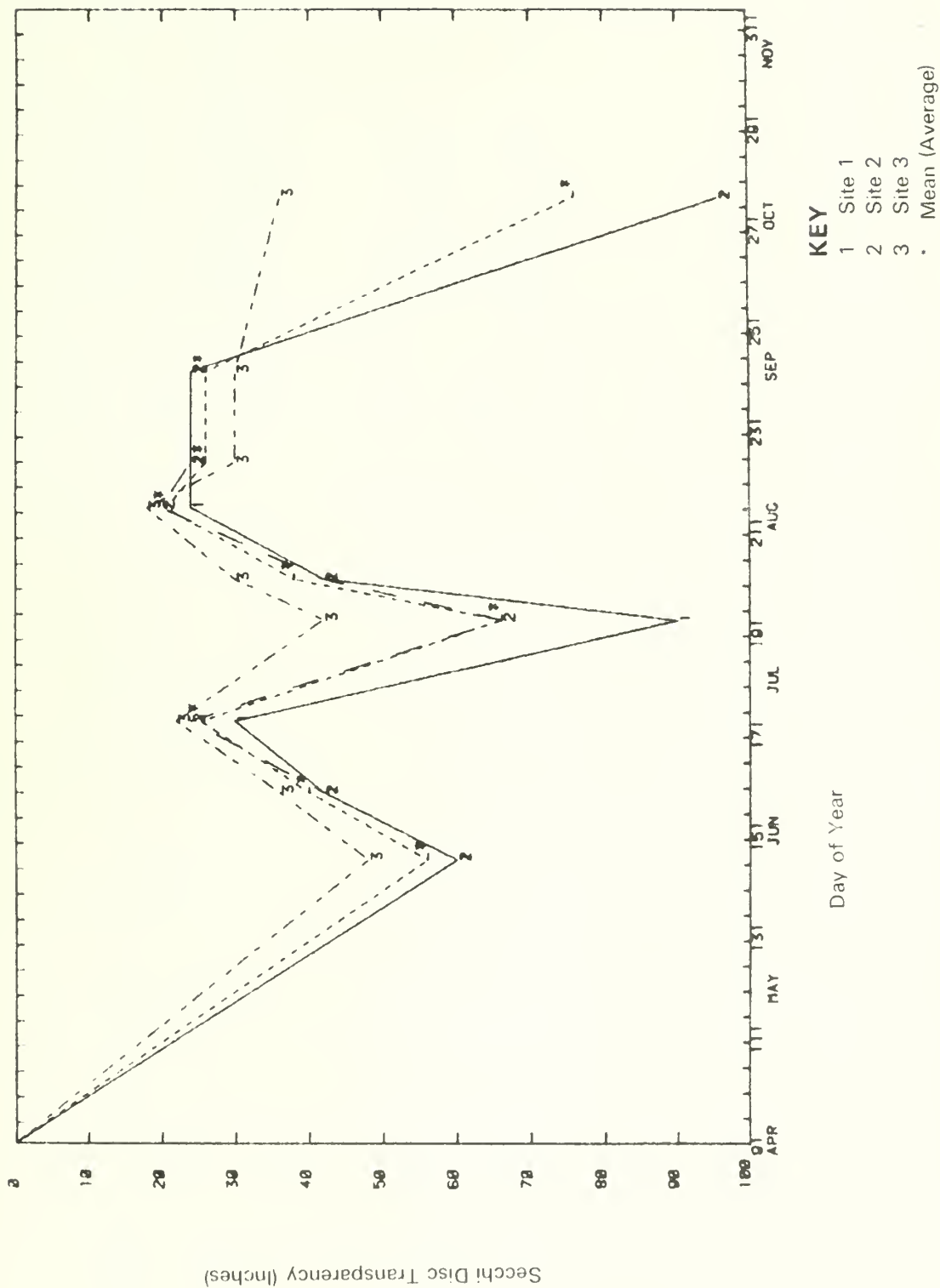


TABLE 4 . FIELD OBSERVATIONS, ALTAMONT RESERVOIR, EFFINGHAM COUNTY, ILLINOIS

| DATE    | OBSERVATION   | SITE   |  |  | WEATHER AT LAKE   | PRESENT                                    | PRECEDING<br>24 HOURS                             | OTHER COMMENTS  |
|---------|---|--|--|--|---|--|---|---|
| 5-27-81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | Grn brn<br>slight<br>minimal<br>slight<br>slight<br>none<br>none       | grn-brn<br>slight<br>minimal<br>slight<br>slight<br>none<br>none       | grn-brn<br>slight<br>minimal<br>slight<br>slight<br>none<br>none       | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | overcast<br>no rain<br>ripple<br>warm<br>S | overcast<br>v. lt. rain<br>small<br>cool<br>N     | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS:   |
|         |   |  |  |  | OBSERVATIONS MADE BY:   | Steve Evans                                |   |   |
| DATE    | OBSERVATION   | SITE   |  |  | WEATHER AT LAKE   | PRESENT                                    | PRECEDING<br>24 HOURS                             | OTHER COMMENTS  |
| 6/9/81  | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | grnsh-brn<br>slight<br>minimal<br>minimal<br>slight<br>none<br>none    | grnsh-brn<br>slight<br>minimal<br>minimal<br>slight<br>none<br>none    | grnsh-brn<br>slight<br>minimal<br>minimal<br>slight<br>none<br>none    | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | clear<br>no rain<br>ripple<br>hot<br>N     | many clouds<br>lt. rain<br>ripple<br>warm<br>W    | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS:   |
|         |   |  |  |  | OBSERVATIONS MADE BY:   | Steve Evans                                |   |   |
| DATE    | OBSERVATION   | SITE   |  |  | WEATHER AT LAKE   | PRESENT                                    | PRECEDING<br>24 HOURS                             | OTHER COMMENTS  |
| 6/23/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | brnsh-grn<br>moderate<br>minimal<br>minimal<br>minimal<br>none<br>none | brnsh-grn<br>moderate<br>minimal<br>minimal<br>minimal<br>none<br>none | brnsh-grn<br>moderate<br>minimal<br>minimal<br>minimal<br>none<br>none | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | hazy<br>no rain<br>ripple<br>warm<br>S     | many clouds<br>mod. rain<br>moderate<br>warm<br>N | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br>6/9/81 copper sulfate<br>75% of lake - 400 lbs. - algal growth<br>ADDITIONAL COMMENTS: |
|         |   |  |  |  | OBSERVATIONS MADE BY:   | Steve Evans                                |   |   |
| DATE    | OBSERVATION   | SITE   |  |  | WEATHER AT LAKE   | PRESENT                                    | PRECEDING<br>24 HOURS                             | OTHER COMMENTS  |
| 7/13/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | mod. green<br>slight<br>minimal<br>minimal<br>minimal<br>none<br>none  | mod. green<br>slight<br>minimal<br>minimal<br>minimal<br>none<br>none  | mod. green<br>slight<br>minimal<br>minimal<br>minimal<br>none<br>none  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | clear<br>none<br>ripple<br>hot<br>NW       | clear<br>none<br>ripple<br>hot<br>W               | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS:   |
|         |   |  |  |  | OBSERVATIONS MADE BY:   | Steve Evans                                |   |   |

TABLE 4 . FIELD OBSERVATIONS, ALTAMONT RESERVOIR, EFFINGHAM COUNTY, ILLINOIS

| DATE    | OBSERVATION   | SITE 1   | SITE 2  | SITE 3   | WEATHER AT LAKE   | PRESENT                                     | PRECEDING<br>24 HOURS                                      | OTHER COMMENTS  |
|---------|---|--|---|--|---|---|--|---|
| 7/21/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | brnsh-grn<br>moderate<br>slight<br>slight<br>slight<br>detritus<br>no odor       | brnsh-grn<br>moderate<br>slight<br>slight<br>slight<br>detritus<br>no odor                    | brnsh-grn<br>moderate<br>slight<br>slight<br>slight<br>detritus<br>no odor                   | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | clear<br>no rain<br>small<br>warm<br>NE     | many clouds<br>heavy rain<br>moderate<br>cool<br>N         | WATER LEVEL OF LAKE: normal<br>RECREATIONAL USAGE: fishing,<br>row boating/canoeing<br>LAKE MANAGEMENT: none<br>ADDITIONAL COMMENTS: Will be treating<br>with 400# copper sulfate today 7/21/81.  |
| 8/4/81  | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | very green<br>minimal<br>moderate<br>slight<br>"clippings"<br>grassy or<br>woody | very green<br>minimal<br>moderate<br>slight<br>"clippings"<br>grassy or<br>woody              | very green<br>minimal<br>moderate<br>slight<br>"clippings"<br>grassy or<br>woody             | WEATHER AT LAKE   | PRESENT                                     | PRECEDING<br>24 HOURS                                      | OTHER COMMENTS  |
|         |   |  |   |  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | few clouds<br>no rain<br>calm<br>hot<br>NE  | clear<br>no rain<br>calm<br>hot<br>N                       | WATER LEVEL OF LAKE: normal<br>RECREATIONAL USAGE: fishing<br>LAKE MANAGEMENT: 7/21/81 400# copper<br>sulfate for algae control<br>ADDITIONAL COMMENTS: To date no apparent<br>effect. Today I'm going to copper sul-<br>fate with another 400#. 8/4/81 |
| 8/13/8  | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | very green<br>slight<br>slight<br>minimal<br>minimal<br>algal col.<br>no odor    | very green<br>slight<br>slight<br>minimal<br>minimal<br>"clippings"<br>algal, col.<br>no odor | very green<br>slight<br>slight<br>minimal<br>minimal<br>"clippings"<br>algal col.<br>no odor | WEATHER AT LAKE   | PRESENT                                     | PRECEDING<br>24 HOURS                                      | OTHER COMMENTS  |
|         |   |  |   |  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | hazy<br>no rain<br>calm<br>warm<br>S        | hazy<br>no rain<br>calm<br>warm<br>SW                      | WATER LEVEL OF LAKE: below normal 2'<br>RECREATIONAL USAGE: fishing,<br>row boating/canoeing<br>LAKE MANAGEMENT: 8/13/81 copper sul-<br>fate all over lake. 800# - algae control<br>ADDITIONAL COMMENTS:  |
| 8/31/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: | brwn-grn.<br>slight<br>minimal<br>minimal<br>slight<br>no odor                   | brwn-grn.<br>slight<br>minimal<br>minimal<br>slight<br>no odor                                | brwn-grn.<br>slight<br>minimal<br>minimal<br>slight<br>no odor                               | WEATHER AT LAKE   | PRESENT                                     | PRECEDING<br>24 HOURS                                      | OTHER COMMENTS  |
|         |   |  |   |  | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | hazy<br>no rain<br>small waves<br>warm<br>n | many clouds<br>moderate rain<br>moderate wave<br>warm<br>n | WATER LEVEL OF LAKE: below normal - 2-3'<br>RECREATIONAL USAGE: fishing<br>LAKE MANAGEMENT: copper sulfate, all over<br>lake, 800 lbs. for algae control.<br>ADDITIONAL COMMENTS:   |

TABLE 4. FIELD OBSERVATIONS, ALTAMONT RESERVOIR, EFFINGHAM COUNTY, ILLINOIS

| DATE    | OBSERVATION   | SITE 1  | SITE 2  | SITE 3  | WEATHER AT LAKE   | PRESENT                                     | PRECEDING<br>24 HOURS                            | OTHER COMMENTS  |
|---------|---|---|---|---|---|---|--|---|
| 10/5/81 | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br><br>ODOR: | 1t. brown<br>minimal<br>minimal<br>minimal<br>slight<br>none<br><br>no odor | 1t. brown<br>minimal<br>minimal<br>minimal<br>slight<br>none<br><br>no odor | 1t. brown<br>minimal<br>minimal<br>minimal<br>slight<br>none<br><br>no odor | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION: | few clouds<br>no rain<br>calm<br>warm<br>SE | few clouds<br>V. lt. rain<br>ripple<br>warm<br>E | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS: |

| DATE | OBSERVATION   | SITE 1 | SITE 2 | SITE 3 | WEATHER AT LAKE  | PRESENT | PRECEDING<br>24 HOURS | OTHER COMMENTS  |
|------|---|--------|--------|--------|--|---------|-----------------------|---|
|      | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: |        |        |        | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br><br>OBSERVATIONS MADE BY: |         |                       | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS: |

| DATE | OBSERVATION   | SITE 1 | SITE 2 | SITE 3 | WEATHER AT LAKE  | PRESENT | PRECEDING<br>24 HOURS | OTHER COMMENTS  |
|------|---|--------|--------|--------|--|---------|-----------------------|---|
|      | WATER COLOR:<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br>ODOR: |        |        |        | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br>OBSERVATIONS MADE BY: |         |                       | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br>LAKE MANAGEMENT:<br>ADDITIONAL COMMENTS: |

| DATE | OBSERVATION   | SITE   |        |        | WEATHER AT LAKE  |  | PRECEDING<br>24 HOURS   | OTHER COMMENTS |
|------|---|--------|--------|--------|--|--|---|----------------|
|      |   | SITE 1 | SITE 2 | SITE 3 | PRESENT  |  |   |                |
|      | WATER COLOR;<br>SEDIMENT:<br>ALGAE:<br>WEEDS AT SAMPLE SITE:<br>WEEDS NEAR SHORE:<br>OTHER SUBSTANCES:<br><br>ODOR: |        |        |        | CLOUD COVER:<br>PRECIPITATION:<br>WAVES:<br>AIR TEMPERATURE:<br>WIND DIRECTION:<br><br>OBSERVATIONS MADE BY: |  | WATER LEVEL OF LAKE:<br>RECREATIONAL USAGE:<br><br>LAKE MANAGEMENT:<br><br>ADDITIONAL COMMENTS: |                |

There were seasonal differences in the transparency of Altamont New Lake. Lowest transparencies were generally recorded in mid-to late summer, and were probably the result of algal blooms.

Field observations of water color and amount of algae and suspended sediment present indicate that the transparency of Altamont New Lake is influenced primarily by the presence of algae. A green water color was observed, algal colonies were noted on several sampling dates, and copper sulfate was routinely applied for algae control.

#### Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Altamont New Lake (estimated at twice the Secchi depth) ranged from 4.0-16.0 feet at Site 1, from 3.3-16.0 feet at Site 2, and from 3.0-8.0 feet at Site 3. Since this was generally less than the total depth recorded for Sites 1 and 2 and these sites are deep enough to thermally stratify low dissolved oxygen values may be expected in the bottom waters of these sites. Site 3 is so shallow (average depth 4.4 feet) that the euphotic zone extends to the bottom and the waters remain aerated due to mixing from wind and wave activity.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. These substances can contribute to serious taste and odor problems in drinking water if water supply is taken from near the lake bottom during summer stratification. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, and other water quality problems.

## SUMMARY AND RECOMMENDATIONS

### Summary

Altamont New Lake, a small, relatively deep public water supply reservoir in south-central Illinois, was sampled on nine dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Steve Evans recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Altamont New Lake (41.6 inches) ranked 38th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was slightly less than the four feet minimum recommended for swimming by the Department of Public Health and was in the normal range for Illinois lakes.

Altamont New Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Altamont New Lake is undergoing the process of eutrophication as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

### Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of portions of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from cracks in adjacent sewer lines, septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Drawing oxygenated water from the upper strata for water supply use may help alleviate taste and odor problems. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem causing blue-greens and improve fishing. Harvesting of aquatic weeds or use of aquatic screens might also be considered.

Continued monitoring is recommended for Altamont New Lake. Consistent data gathered over a period of years is necessary to fully document water quality trends, identify problems, and evaluate lake/watershed management strategies.

#### REFERENCES

Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

Illinois Department of Public Health. 1976. The Minimum Sanitary Requirements for the Design and Operation of Swimming Pools and Bathing Beaches. State of Illinois, Department of Public Health, Springfield, Illinois.

Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

DS:jab/sp2161c

## GLOSSARY\*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 6000C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

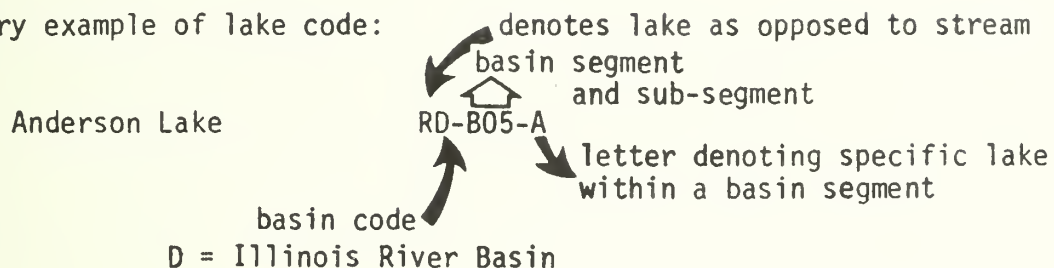
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

## ABBREVIATIONS AND SYMBOLS

av - average  
brn - brown  
brnsh-grn - brownish-green  
grn-brn - green-brown  
grnsh-brn - greenish-brown  
lt - light  
max - maximum value  
min - minimum value  
mod - moderately  
std. dev. - standard deviation  
v - very

Explanatory example of lake code:



\*Definitions of items in sense used in text

DS:sp,6207a,1-8





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